THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXVII. No. 2156.] LONDON, SEPTEMBER 6, 1904. [56TH YEAR. PRICE 6d.

PARKER & LESTER,

— *ESTABLISHED 1830.* —

MANUFACTURERS AND CONTRACTORS, **ORMSIDE STREET, LONDON, S.E.**

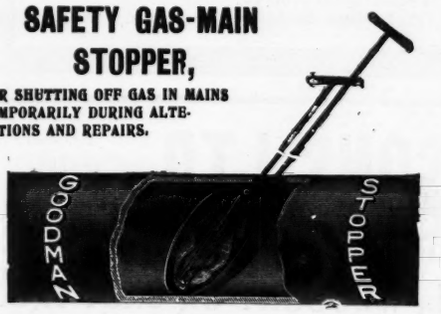
THE ONLY MAKERS OF

PATENT ANTIMONY PAINT & PARKER'S IMPERIAL BLACK VARNISH.

OXIDE PAINTS, OILS, AND GENERAL STORES, FOR GAS AND WATER WORKS.

SAFETY GAS-MAIN STOPPER,

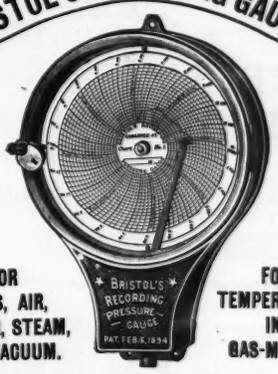
FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS.



GAS-LEAK INDICATOR.

PRICES AND PARTICULARS ON APPLICATION.

BRISTOL'S RECORDING GAUGES



FOR GAS, AIR, WATER, STEAM, OR VACUUM.

FOR TEMPERATURE IN GAS-MAINS.

Many Thousands in Daily Operation.

J. W. & C. J. PHILLIPS,
23, COLLEGE HILL,
LONDON, E.C.

All Pipes marked
"S.A.V."

VERTICALLY CAST IRON PIPES.

The only Foundry in Europe casting Pipes under Clarifying Process.

A. G. CLOAKE,

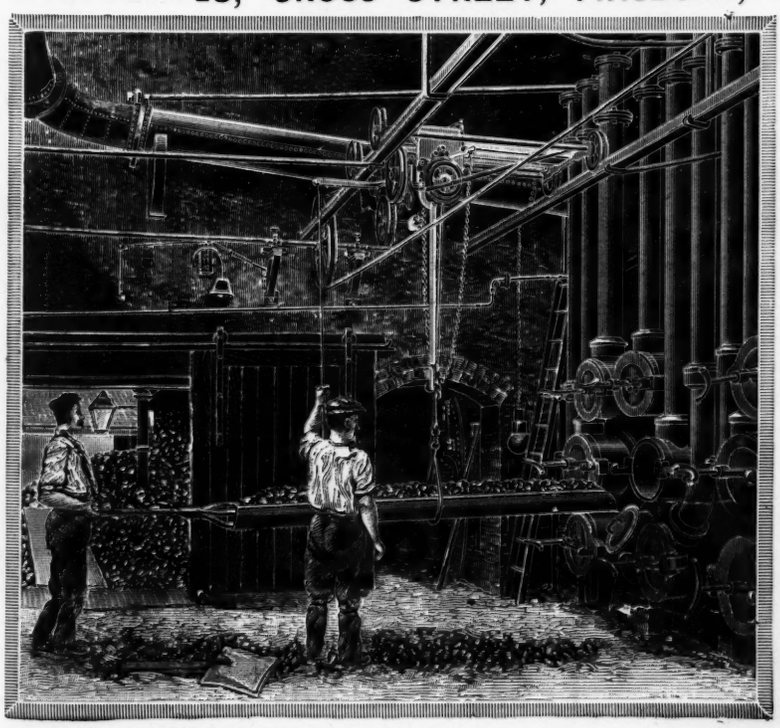
Telegrams: "AMOUR, LONDON."
Telephone Nos.: 1890 HOLBORN; CENTRAL 194.

54, HOLBORN VIADUCT, LONDON, E.C.

BIGGS, WALL, & CO.,

13, CROSS STREET, FINSBURY, LONDON, E.C.

Telegrams: "RAGOUT, LONDON."
Telephone: 273 CENTRAL.



"RAPID"
MANUAL & POWER
CHARGING APPARATUS,

FOR GAS-WORKS OF ALL SIZES.

Repeat Orders
YEOVIL, NEWPORT, SOUTHBANK, WORTHING, ALDERSHOT.

Machines can be seen working at any of the following Works:—

ALDERSHOT	WREXHAM
WORTHING	SWINDON
YEOVIL	EPSOM
TRURO	SHETTLESTON
NORMANTON	DUBLIN
OTLEY	G. S. & W. Rly. Works
GOOLE	NEWPORT, MON.

1000 CANDLE POWER AT 1d. PER HOUR.

The Cheapest, Cleanest, and most Efficient Light upon the Market.

It is particularly adapted for Engineering Works, Foundries, Breweries, Dye Works, Collieries, Brick Works, and all large Shops and Spaces.

Will save 50 per cent. on Lighting Bill where either Electric Light or Gas are in use.

Installations of from 500-Candle Power to any amount can be erected in one to four weeks according to size.

Write to-day for Particulars to

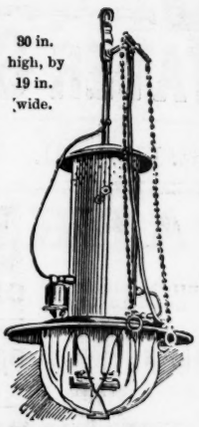
THE UNITED KINGDOM LIGHTING TRUST, Ltd.,
DEPT. B.
99, CANNON STREET, LONDON, E.C.

4 ft. 6 in. high by 18 in. wide.

Oil Reservoir and Pump.

The following well-known Firms are users of the System—

J. H. ANDREW & CO., Ltd., Sheffield.
Sir W. G. ARMSTRONG, WHITWORTH, & CO., Ltd., Manchester.
H. BESSEMER & CO., Ltd., Sheffield.
CRAMLINGTON COLLIERY CO., Ltd., Northumberland.
CHARLES CAMMELL & CO., Ltd., Sheffield.
HAMSTEELS COLLIERY CO., Ltd., Durham.
HUNSLET ENGINE CO., Ltd., Leeds.
SMITH & COVENTRY, Ltd., Salford, Manchester.



30 in. high, by 19 in. wide.

Hanging Lamp, 1000-c.p.

Telegrams: "COCKEYS, FROME."

EDWARD COCKEY & SONS, LTD.,

Telegrams: "DAMPER, LONDON."

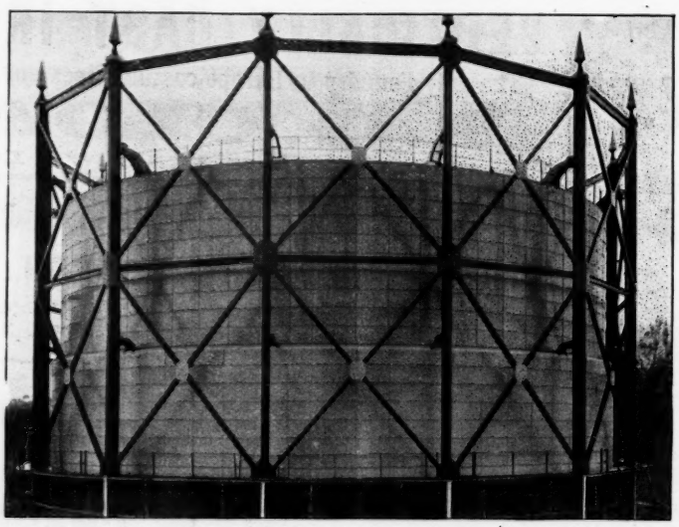
GASHOLDERS IN EITHER STEEL OR WROUGHT IRON.

GASHOLDER TANKS IN STEEL, WROUGHT OR CAST IRON.

CAST-IRON COLUMNS.

STEEL or WROUGHT IRON STANDARDS.
(Any Section.)

INLET and OUTLET PIPES in either CAST or WROUGHT IRON, or STEEL.

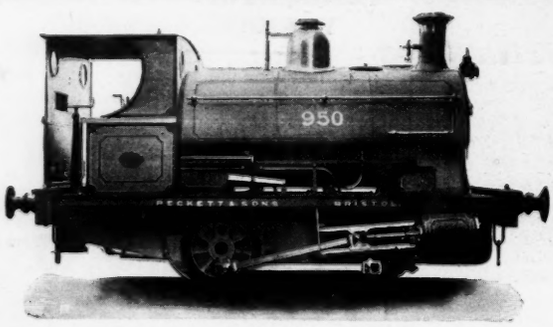


HYDRAULIC MAINS.
FOUL MAINS.
CONDENSERS.
RETORT-LIDS.
PURIFIERS.
HYDRAULIC LIFTS.
ROOFS.
BOILERS in either WROUGHT IRON or STEEL.

LAMP COLUMNS, MAIN PIPES, and IRREGULARS always in Stock

THE IRON-WORKS, FROME, SOMERSET.

London Office: 181, QUEEN VICTORIA STREET, E.C. *BALE & HARDY, Agents.*



LOCOMOTIVES

LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for immediate Delivery.

Photographs, Specifications, and Prices on Application.

PECKETT & SONS, Atlas Locomotive Works, BRISTOL.

Telegraphic Address: "PECKETT, BRISTOL."

THE BARROWFIELD IRON-WORKS, LIMITED,

GAS ENGINEERS & CONTRACTORS,

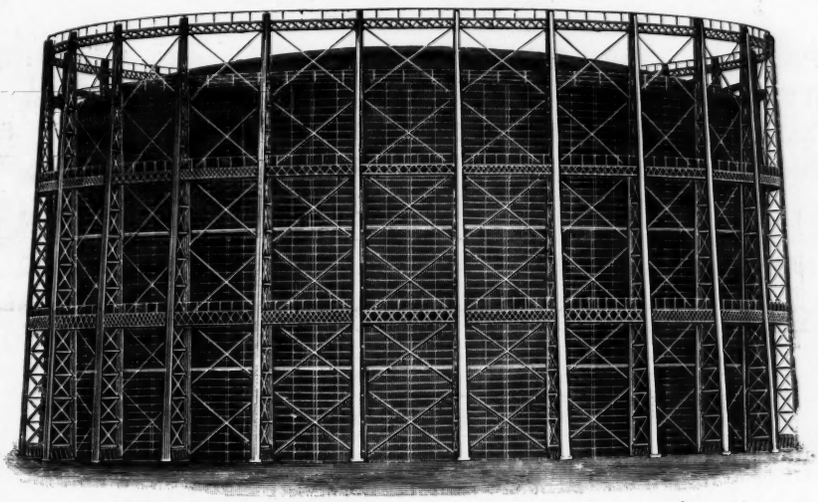
Telegrams: "GASOMETER GLASGOW." **GLASGOW.**

OIL PLANT AND CHEMICAL APPARATUS.

BRIDGES, GIRDERS WHARVES, PIERS.

ROOFING OF EVERY STYLE.

PIPES VALVES. AND CONNECTIONS.



GAS APPARATUS OF EVERY DESCRIPTION.

RETORTS, CONDENSERS. SCRUBBERS, PURIFIERS.

GASHOLDERS AND TANKS.

ENGINES, EXHAUSTERS, STEAM BOILERS, AND FITTINGS.

THREE-LIFT GASHOLDER. Capacity, SIX MILLION cubic feet. 240 feet Diameter by 45 feet Deep each Lift. Erected at Glasgow.

London Office: 6, LITTLE BUSH LANE, CANNON STREET.

GEORGE ORME & CO. (Branch of Meters Ltd.)

ATLAS METER WORKS,

Tel. Address: "ORME OLDHAM." Telephone No. 93 Oldham.

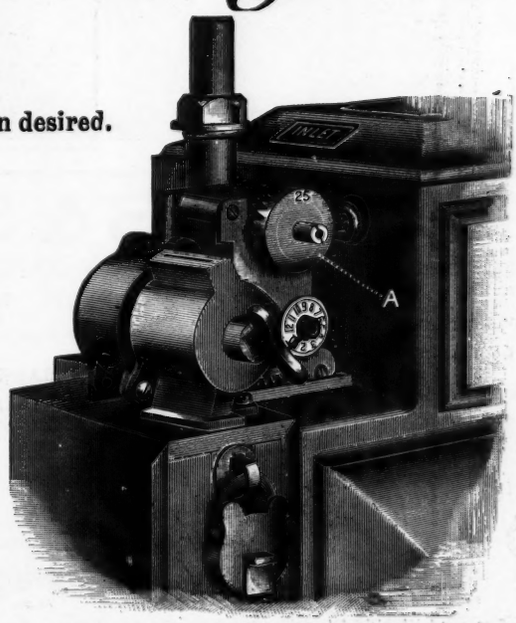
PARK STREET, OLDHAM.

"NEW CENTURY" PATTERN

Patent Coin ***Prepayment Gas-Meters***

Fitted with Detachable Attachments.

Arranged for 1d., 1s., or any other Coin desired.



Change of Price effected by simply removing Crown Wheel "A" and replacing same with another Wheel.

ANY FURTHER PARTICULARS WILL BE SUPPLIED UPON APPLICATION.

NEWTON, CHAMBERS, & CO.,

LIMITED,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

Established 1790

LONDON OFFICE: 19, Great George Street, WESTMINSTER.

Telegraphic Addresses: "NEWTON, SHEFFIELD," "ACCOLADE, LONDON."

GAS ENGINEERS, IRONFOUNDERS, & CONTRACTORS.

MANUFACTURERS OF EVERY DESCRIPTION OF

PLANT, APPARATUS, AND MACHINERY FOR GAS AND CHEMICAL WORKS.
RETORTS AND FITTINGS, MOUTHPIECES WITH SELF-SEALING LIDS.
IMPROVED COAL AND COKE HANDLING PLANT, CONVEYORS, AND ELEVATORS.
CONDENSERS, SCRUBBERS, AND WASHERS.

PURIFIERS with Planed Joints a Speciality.

PATENT CENTRE-VALVES, RACK AND SCREW VALVES, WOOD GRIDS AND SCRUBBER-BOARDS, CAST-IRON MAINS, AND SPECIALS.
STRUCTURAL WORK, COLUMNS, GIRDERS, AND ROOFING.
GASHOLDERS, CAST-IRON OR STEEL TANKS.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

PIG IRON (SPECIAL QUALITY) for Engine Cylinders. GAS COAL famous for its unrivalled excellence.

BARRY, HENRY, & CO.,

— LIMITED. —

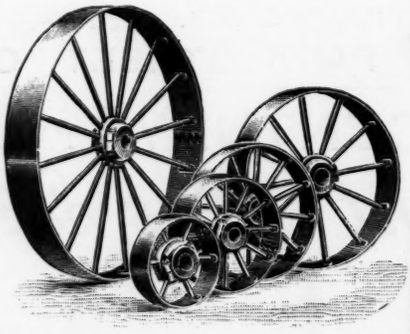
Specialities:

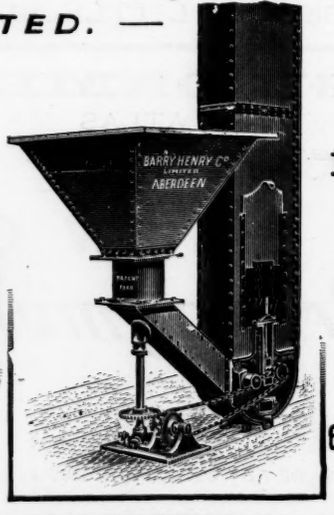
TRANSMISSION OF POWER.

Rope & Belt Pulleys,
Spur & Bevel Wheels,
Shafting & Couplings,
Pedestals, & Fixings.

WORKS:

ABERDEEN, SCOTLAND.





Specialities:

TRANSMISSION OF MATERIALS.

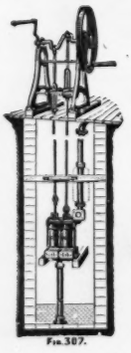
Conveyors,
Elevators,
Grinding Machinery,
Motors.

AND

64, MARK LANE, LONDON, E.C.

JOSEPH EVANS & SONS,

CULWELL WORKS, WOLVERHAMPTON.



London Address:
Salisbury House, London Wall, London, E.C.

PLEASE APPLY FOR CATALOGUE No. 8.

Telegrams:
"EVANS, WOLVERHAMPTON."
National Telephone No. 7039.

TRADE MARK.
FIRST AWARDS EVERYWHERE.

See next Week's Advertisement for Steam-Pumps, Tar and Liquor Pumps, &c.

WELSBACH KERN

THREE-BURNER HOT-PLATE.

Each Burner of Varying Power.

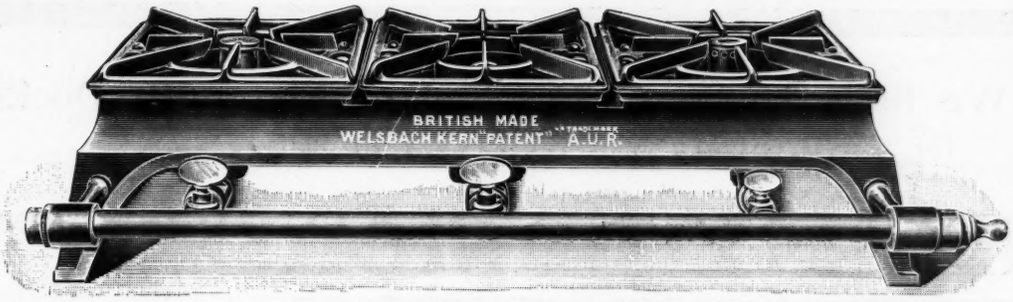
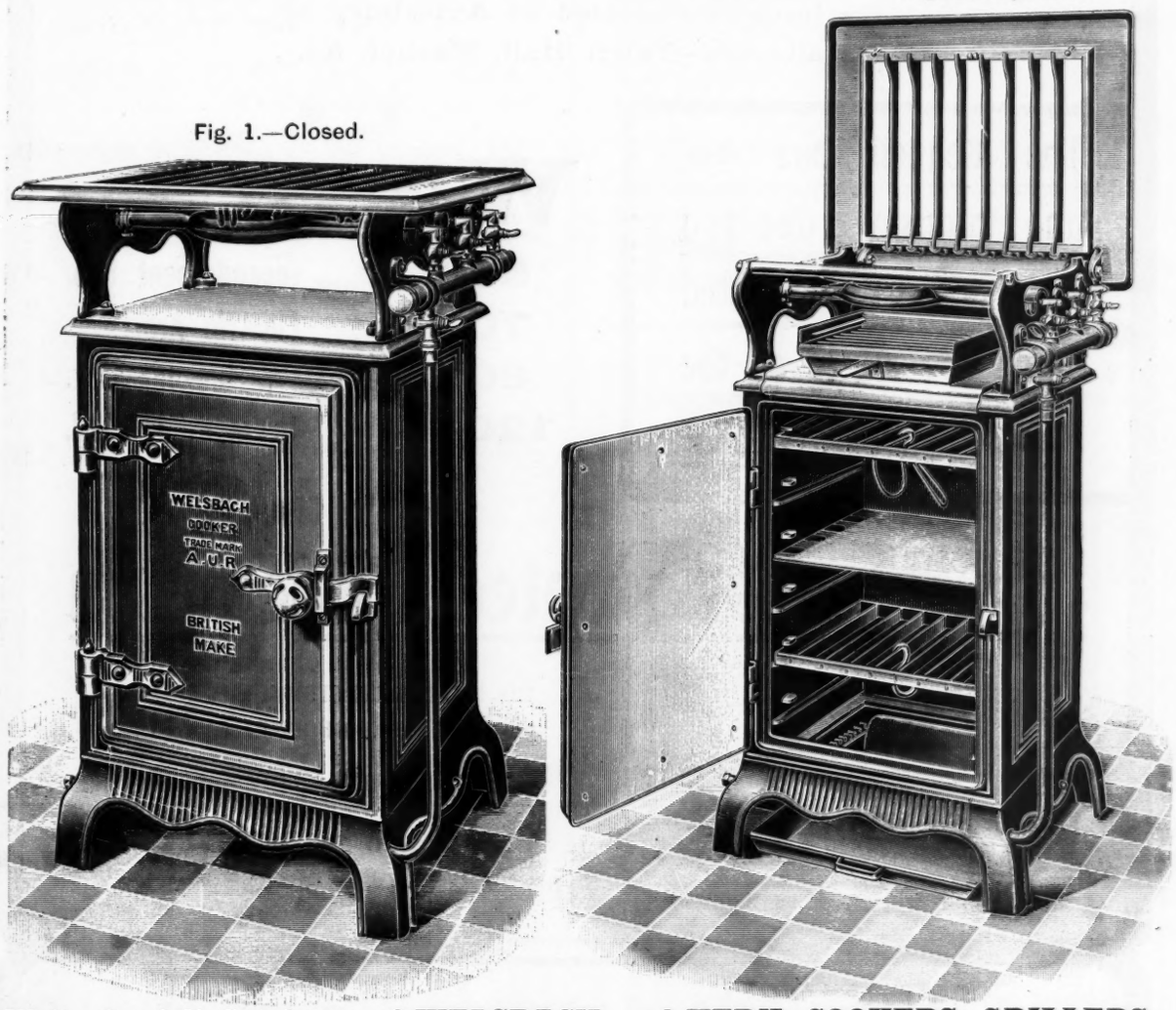


Fig. 2.—Open.

Fig. 1.—Closed.



Write for full Catalogue of WELSBACH and KERN COOKERS, GRILLERS, BOILERS, HOT-PLATES, IRONING-STOVES, &c.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,

2-14, Palmer Street, Westminster, London, S.W.

Telegrams: "WELSBACH, LONDON." Telephone: 290 WESTMINSTER.

THIS TALKS!!!

We have Lighted a Section of Plymouth Docks
for the Great Western Railway Company.

An Extension has been Ordered.

We have completed at Aylesbury an Installation—Town Hall, Market, &c.

The Council has unanimously decided that we be requested to do the whole of the Public Lighting.

We are

50 per cent. Cheaper than Incandescent Gas.
70 ,, Electric Arc.
80 ,, ,, Incandescent.
120 ,, Ordinary Fishtail.

BERLIN, the Finest Lighted City in the World, **has adopted Millennium**

It is the **LAST WORD.**

THE MILLENNIUM SYSTEM IS A METHOD OF COMPRESSING ORDINARY GAS. . . . .

If you want to get **MORE LIGHT** and **CUT THE COST**, write—

The British Compressed Gas Co., Ld.,

57, BARBICAN, E.C.

THE

'BRIGHTRAY'

INVERTED CLUSTER LAMP.

Patented and Registered.

The only Practical Inverted Cluster Lamp on the Market.

NOTHING TO GET OUT OF ORDER.

GIVES A SPLENDID PENETRATING LIGHT, AND IS ABSOLUTELY SHADOWLESS.

Made with Interior Bye-Pass Arrangement.

3-light Lamp, made expressly for Interior Lighting.

Length over all, 19 inches. Reflector, 20 inches.

Candle-power, 200-220.

Consumption, about 10 feet of gas per hour.

PRICE,

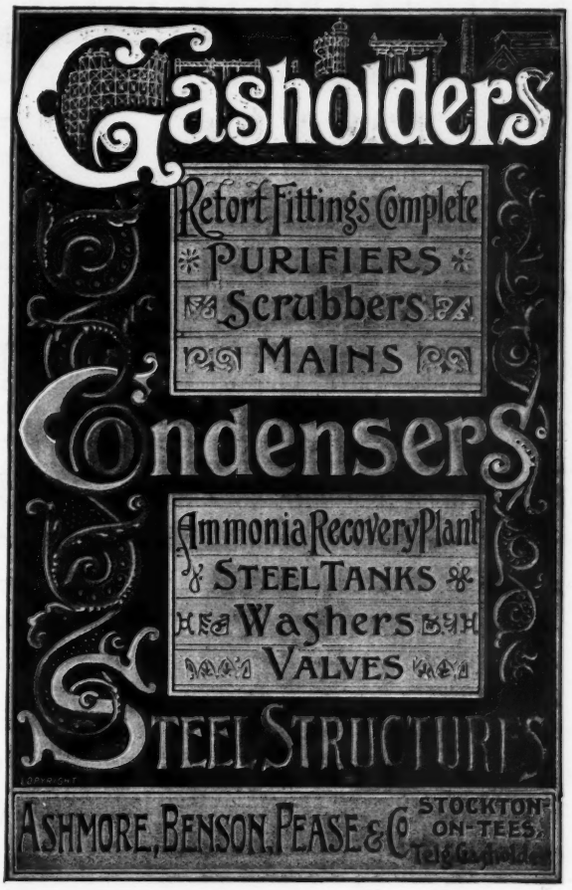
66/-, complete with Mantles, &c., subject.

Write for New List and Prices.

J.&W.B. SMITH,

SPECIALISTS IN INCANDESCENT GAS LIGHTING,

19 to 23, Farringdon Road, LONDON, E.C.



'BRAY'

INCANDESCENT GAS

Burners AND Mantles.

THE

"BRAY" XXX.

MANTLE.

Best Ramie, Double Woven, Extra Quality.

Send for Catalogue.

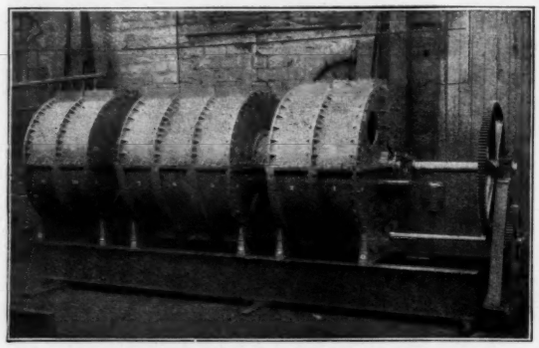
Geo. Bray & Co.,

— LIMITED, —

GAS LIGHTING ENGINEERS,

BAGBY WORKS, LEEDS.

KIRKHAM, HULETT, & CHANDLER, LTD.



IMPROVED PATENT

"STANDARD" WASHER-SCRUBBERS

with Isolated Bearing Chambers, giving access to bearings—no additional stuffing boxes or connections required.

Extracts **ALL** the Ammonia and large porportion of CO_2 and H_2S.
Maximum washing surface, **ALL** of which is effective.
Prevention of slip of gas unwashed.

Offices: Palace Chambers, Bridge St., Westminster, S.W.
Tel. Ad.: "Washer, London." Tel. No.: 127 Victoria.

COAL TAR PRODUCTS.

Benzol, Toluol, Solvent Naphtha, Creosote Oils, Grease Oils, Carbolic Acid, Crude Creosote Salts, Granulated (Crude) Naphthalene, Sublimed Naphthalene, Anthracene, Refined Tar, Pitch, also Sulphate of Ammonia.

For Prices apply to the SOUTH METROPOLITAN GAS COMPANY,

Works: ORDNANCE WHARF, EAST GREENWICH, LONDON, S.E.

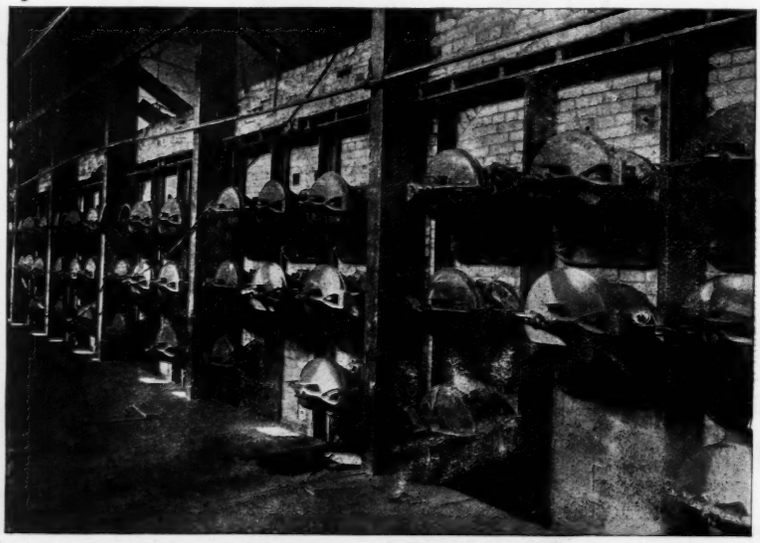
709, OLD KENT ROAD, LONDON, S.E.

Telegraphic Address: "METROGAS, LONDON."

INSTALLATIONS OF INCLINED RETORTS COMPLETE.

DRAKES LTD.

HALIFAX. *Telegrams:* "DRAKESON, HALIFAX." *Telephone:* "No. 43 HALIFAX."



COAL
AND
COKE
BREAKING,
ELEVATING,
CONVEYING,
SCREENING,
PLANTS.

LONDON:
181, QUEEN VICTORIA ST., E.C.
NEW YORK:
395, BROADWAY.

IT IS NO EXPERIMENT

To place the

"ACME"

ON HIRE.

IT

CREATES

A WIDE

DEMAND.

ARDEN HILL & CO., "ACME" WORKS, BIRMINGHAM.

THE GAS-METER COMPANY,

MANUFACTURERS OF

WET AND DRY GAS-METERS, STATION METERS, GOVERNORS, GAS APPARATUS, ETC.

SQUARE STATION METERS WITH PLANED JOINTS.

STATION METERS IN CYLINDRICAL CASES.

DESIGN No. 2 PATTERN.

STATION METERS MADE AT THE COMPANY'S WORKS, OLDHAM (Late WEST & GREGSON). Established 1830.

For Prices and Particulars apply

F. W. CHURCH, Secretary.

Works: 238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

Telegraphic Addresses: "METER LONDON." "METER OLDHAM." "METER DUBLIN." "METER MANCHESTER."

Telephone Nos.: 142 Dalston (Nat.); 340 Oldham (Nat.); 1995 Dublin (Nat).; 2918 Manchester (Nat.)

[See Advertisement on back of Wrapper.

HENRY BALFOUR & CO.

LIMITED,

LEVEN, FIFESHIRE.

Contractors for the Supply and Erection of all Classes of

Gas-Works Plant.

THE "ANNULAR" BRUSH WASHER-SCRUBBER

(CREEKE'S PATENT).

Made with Cast-Iron or Mild Steel Cylinders.

PRICES AND PARTICULARS ON APPLICATION.

London Representative: MR. HENRY PUPLETT, 47, VICTORIA STREET, S.W.

THE ORIGINAL NEW INVERTED INCANDESCENT GAS-BURNERS

BRITISH MANUFACTURE.

INCREASED DISCOUNTS TO THE TRADE.

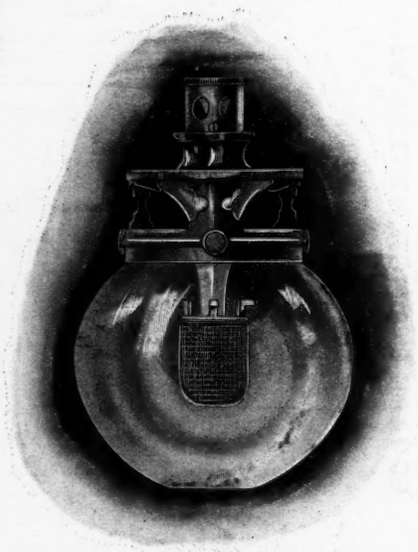
New types of BURNERS at popular Prices for the coming Season.

No. 2 Burner only, in Polished Brass or Steel Bronze, 4s. 6d.
Globes from 6d. each. Mantles 7s. per dozen.

MAXIMUM LIGHT WITH MINIMUM CONSUMPTION OF GAS.

The "Bijou" Burner in clusters for interior lighting has the decorative effect of Electric light at One-Eighth the cost.

NEW LISTS NOW READY.



No. 3 "Bijou" Burner only, in Polished Brass or Steel Bronze, 3s.
Globes from 4d. each. Mantles 6s. 6d. per dozen.

ONLY ADDRESS: THE NEW INVERTED INCANDESCENT GAS LAMP CO., LD.,

23, FARRINGDON AVENUE, E.C.

CONTENTS.

EDITORIAL NOTES.

GAS, &c.—
Gas Companies and Depreciation . . . 649
The Report of the Proceedings before the Board of Trade Gas Testing Committee. 649
Glasgow Gas Department Accounts . . . 650
The Consolidation of Gas Undertakings . 651
Coal Production and Consumption . . . 651
Co-Operation in Preparing a Gas Encyclopædia: The First Steps—Lighting and Advertising the Earl's Court Exhibition—Carburetted Water Gas—The Utilization of Gas Coke, and the Hygienic Value of Smoke] 652

ESSAYS AND REVIEWS.

Death of Mr. Edward Drory 653
Gas Stock and Share Market 654
Electric Lighting Memoranda 654
Service with a Company or a Corporation—Which is Best? 655
Workmen's Compensation Statistics . . . 655

COMMUNICATED ARTICLES.

Some Lessons from "Field's Analysis." By H. E. Jones, M.Inst.C.E. 656
Gas Purification by Ammoniacal Liquor. By Thomas Holgate, F.C.S., M.Inst.C.E. . . 657
The Value of Ramie to the Gas Industry. By F. R. E. Branston 661

TECHNICAL RECORD.

The Utilization of Gas Coke 662
Utilizing the Waste Heat of Gas-Engines. . 663
The Design of Gas Fittings 664
An Inverted Incandescent Mantle Cluster Lamp 665
Improvements in the "Pond" Lamps . . 666

CORRESPONDENCE.

The South Suburban Gas Company's Circular and Carburetted Water Gas 669
Engineers and Contractors 669
Gas Purification by Ammoniacal Liquor . . 669
The New Patent Office Procedure 669

REGISTER OF PATENTS.

Producing Mixtures of Gas and Air—Lake, H. H. (Selas Gesellschaft, m. b. H). . . 666
Increasing the Output of a Four-Cycle Internal Combustion Engine—Lindemann, O. . 666
Coin-Counting and Registering Attachments for Prepayment Gas-Meters--Burley, J. C. D. and Gilmore, A. E. 666
Supporting Mantles on Inverted Incandescent Gas-Lamps—The New Inverted Incandescent Gas-Lamp Company, Limited, and Bridger, J. 667
Inverted Incandescent Gas-Lamps--Kramer, E. 667
Atmospheric Gas-Burners—Ehmann, C. P. . 667
Rotary Gas Engines—Farwell, F. O. . . . 667
Atmospheric Gas-Burners in Combination with Reflectors and Protectors for Same—Cox, G. J. 667
Heating and Incandescent Gas-Burners—Rettich, V. A. 667
Incandescent Gas-Burners—Rettich, V. A. . 668
Inverted Incandescent Gas-Light—Wolff, L. 668
Locating Leakages in Underground Gas-Conduits—Wilkelmi, O. 668
Patent Notices 668

LEGAL INTELLIGENCE.

High Court of Justice—Chancery Division—Soothill Upper Urban District Council *v.* Wakefield District Council and East and West Ardsley District Councils . . . 670
The Scott-Snell Self-Intensifying Gas-Lamp Company, Limited 671
An Illegal Connection with a Gas-Main . . 671

MISCELLANEOUS NEWS.

Committee on Metropolitan Gas Testing. . 672
Glasgow Corporation Gas Supply 677
Provincial Gas Companies 679
Stock and Share List 679
Critical Position of the Madrid Gas Company 681
Gas *v.* Electricity at Ormskirk 682

MISCELLANEOUS NEWS (*continued*)—

Dublin's Electric Light Burden 682
Longton Gas and Electricity Supply . . . 683
Gas Lighting of Kingsteignton 684
Notes from Scotland 684
Current Sales of Gas Products 686
Coal Trade Reports 687

PARAGRAPHS.

Binding Material for Briquettes 653
Waverley Association of Gas Managers—Recent Progress in Large Gas-Engines—The Late Mr. Lewis Thompson's Bequest to Byker (Newcastle)—Use of Tar in Road Making—"Perfect" Gas-Engine Starter . 656
Personal 661
The Eastern Counties Gas Managers' Association—Monazite Sand—The Manchester District Institution of Gas Engineers—New Coal-Handling Plant at Beckton . . 661
Gas-Engines for Generating Electricity—Radio-Activity of Natural Gas—Litigation over Inverted Burners in France . . . 666
Aberavon Gas Supply—Acetylene Lighting in the Southport District—Profit-Sharing in Gas-Works 671
Lead Poisoning at Oldham 681
Sale of Shares—Reduction in Price—Proposed Reassessment of the Southampton Gas Undertaking 687
Electric Light Failure at Preston—Loughborough Gas and Water Undertakings—Dalkey Public Lighting—Attempted Destruction of a Reservoir by Dynamite—Coventry and the Earl's Court Gas Exhibition—Waste of Water at Preston . . . 688
Felsted and its Water Supply—Incandescent Gas in Dublin Preferred to the Electric Light—Rats as the Cause of a Gas Explosion—Fatal Accident to a Workman at the Swansea Gas-Works 689

Messrs. HUMPHREYS & GLASGOW

AND

THE UNITED GAS IMPROVEMENT CO., U.S.A.

CARBURETTED-WATER-GAS PLANT

— *DOUBLE-SUPERHEATER SYSTEM.* —

H. & G., LONDON **151,000,000** Cu. Ft. Daily

U. G. I. CO., U.S.A. **429,700,000** Cu. Ft. Daily

TOTAL 580,700,000 Cu. Ft. Daily

Messrs. HUMPHREYS & GLASGOW,
38, Victoria Street, London, S.W.
31, Nassau Street, New York.

THE UNITED GAS IMPROVEMENT COMPANY,
Philadelphia.

Telegrams {"EPISTOLARY, LONDON."
"HUMGLAS, NEW YORK."

THOMAS GLOVER & CO.'S

PATENT NEW IMPROVED PREPAYMENT METER

For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 6159 Bank.

THOMAS GLOVER & CO., LTD.,

GAS-METER MANUFACTURERS,

LATE OF CLERKENWELL, NOW 49, QUEEN VICTORIA STREET.

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 6159 Bank.

BRISTOL:	BIRMINGHAM:	MANCHESTER:	GLASGOW:	BELFAST:	MELBOURNE:
18, BATH STREET. *Telegraphic Address:* "GOTHIC." Telephone No. 1005.	57 & 58, BROAD STREET. *Telegraphic Address:* "GOTHIC"	132 & 134, CORN EXCHANGE BUILDINGS. *Telegraphic Address:* "GOTHIC." Telephone No. 3898.	26, WEST NILE STREET. *Telegraphic Address:* "GASMAIN." Telephone No. 6107 Royal.	8, EXCHANGE PLACE, DONEGALL STREET. *Telegraphic Address:* "GOTHIC."	23, WRIGHT'S LANE, LONSDALE STREET, Telephone No. 3716.

PARKINSON'S

PATENT

EQUILIBRIUM GOVERNORS.

These Governors are being used at a great many Works, and all Engineers speak of them in words of unqualified praise.

FITTED WITH SIX COLUMNS and GIRDERS, WEIGHTS or WATER PRESSURE.

PARKINSON AND W. & B. COWAN, LTD.,
(*Parkinson Branch*),
COTTAGE LANE, CITY ROAD, LONDON.
BELL BARN ROAD, BIRMINGHAM.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. LXXXVII., No. 2156.—TUESDAY, SEPTEMBER 6, 1904.

EDITORIAL NOTES—GAS, &c.

Gas Companies and Depreciation.

AMONG the many virtues possessed by the Brentford Gas Company is the hitherto unsuspected one of self-abnegation. An Oliver Twist among the shareholders, asking for more, has been informed by the worthy Chairman that, of the sum which the Company may legally divide, one-half per cent. goes to the reserve fund "for the benefit of posterity," though what "posterity" has ever done for the Company to deserve such consideration does not appear. Some little sympathy may be felt for the shareholders, having regard to the very strong position of the undertaking. In addition to an already considerable reserve fund, the "carry-over" of net revenue is more than equal to a full year's dividend and interest; while large sums are being taken out of the revenue for depreciation of works and plant—to such an extent, indeed, that, with an increase of $5\frac{3}{4}$ per cent. in the gas sold, the amount of capital employed at the end of last half year showed a reduction. The shareholders are thus quadruply safeguarded against any lowering of the present dividend, because not only are there these two large funds to fall back upon, but the price of gas may be raised, and the writing off for depreciation suspended, for the purpose of meeting any temporary falling off in the profits.

Under these circumstances, it is hardly to be wondered at if the shareholders have become a little restive, and desire to participate in the improvement of the Company's affairs, as the provisions of the sliding-scale clearly intend that they should do. It is the object of these provisions to establish a partnership between the consumers and the shareholders by giving the latter a direct interest in reductions of price to the former. When from any cause this interest is withheld, and the price of gas or the rate of dividend, or both, become, as it were, stereotyped, then the utility of the sliding-scale is brought to naught. It should be borne in mind, more often than, unfortunately, it is, that the sliding-scale carries with it duties as well as rights—duties to the consumers and shareholders alike. Better than disregard of these would be adherence to the old system of maximum dividends and maximum price of gas.

This has not been said to deprecate in any way the building up of a strong position. On the contrary, such a position may be held to be necessary in the interests of all concerned—the consumers, the shareholders, and, we should like to have been able to add, as being more generally applicable, the employees alike. A position so weak as to necessitate recourse to raising the price of gas on any slight provocation is clearly most undesirable. There is, however, a great distance between such a position as this and one of practically impregnable strength. What is required is the happy medium. Care for "posterity" requires to be blended with at least an equal regard for present interests. These reflections lead naturally to the observation that there can be no better or sounder means of strengthening the position of any gas undertaking than by having due regard to depreciation.

All works and plant require to be depreciated to a moderate extent. This, it is true, was at one time held to be, if not illegal, at all events irregular, inasmuch as no provision is made for it in the form of accounts scheduled in the Gas-Works Clauses Act, 1871. Opinion has, however, undergone a change in this respect, and the very Company to whom reference is made above—namely, the Brentford—write off every half year an amount from fixed plant, with the sanction of the Official Auditor, as was explained at the half-yearly meeting in February. It is true that gas-works are maintained in efficient working order out of revenue; but it must be equally true that in hardly any case can the original structural value of such works be fully maintained. Take the case, moreover, of a company whose aggregate sales of gas have remained stationary, but who are nevertheless obliged to spend largely on extensions of mains, meters, and services. This surely indicates that in some other direction capital has become either wholly or in part unproductive, and ought to be written off, either directly or indirectly—that is to say, by depreciating the capital value of these items of expenditure, or by providing the additional distributing plant to some extent out of revenue. Let it also be remembered that, whatever the Local Authorities may do in this regard in connection with their electric lighting undertakings (under stress of circumstances), they generally depreciate their gas undertakings very largely. Also that in the history of almost every gas undertaking there comes a time when small plant has to give place to larger. How much easier will the change appear if the cost of the plant which has to be abandoned has already been, even if only partly, written down. This, then, is a policy which may be commended to all gas undertakers, and which is surely open to all to follow, whether with or without the aid of a renewal fund, such as Parliament has recently sanctioned in some few instances.

Report of the Proceedings before the Gas-Testing Committee.

THE interest which would otherwise have attached to the issue of the report of the evidence placed before the Departmental Committee appointed to inquire into the testing of gas in the Metropolis has been largely discounted by the *précis* of the evidence which has already appeared in the "JOURNAL," and by the publication of the Committee's own report and recommendations. It must be said that those who were officially responsible for the preparation, revision, and printing of the evidence in book form, have smartly compassed their task. It was by no means a light matter; seeing that, including the evidence, numerous appendices containing much statistical compilation, and a well-arranged index, the whole occupies some 262 foolscap pages printed in small type. The evidence, too, it is seen, extended over sixteen sittings of the Committee, and was tendered by 23 witnesses, some of whom were called twice and even thrice. The volume forms a record of great historical value; and there is not the least doubt that it is destined to play an important part in the parliamentary procedure on Gas Bills for long to come. Clever counsel and experts will find in it a goodly supply of shafts for future use. Moreover, it presents a mass of matter of a highly technical nature upon which to reflect; and reflection cannot fail to drive home to the unprejudiced the truth that the contents of the blue covers bears witness to a widening and extension of the departure from the days of high-candle power gas, of unnecessary requirement as to purity, and of senseless and vexatious refinement in testing. But the release from the captivity of the past has been far from completed by the report of the Committee; and there is yet much more fighting in front of the industry to finish the work so vigorously carried on during latter years.

The report now before us testifies to another thing; and it is that there is, on the part of many, an unfortunate mixing of the two questions of freedom for the industry in the conduct of the gas supply business and of high *versus* low illuminating power gas. There is a great distinction between the two. Liberty in any business is of the utmost importance to successful management. It enables those who have the direction of the business to judge as to the requirements of their customers, and to so order their methods and wares as to comply with the demand. The draper in one street supplies high-class goods; the draper in the next street finds it to his advantage, because of his special demand, to supply goods of a totally different quality. Apply that, for the purpose of illustration, to the gas industry. Liberty for the industry in meeting the needs and demands of the times and the competition of electricity, does not mean that any undertaking will be called upon to supply, if they prefer not to do so, a gas of a single candle less illuminating power or a gas containing a grain more sulphur. If this distinction between freedom and requirement is drawn, there will, we have great confidence, be some of the minority

who now (perhaps in some cases unconsciously) oppose the former because of their objection to any lowering on their own part of the latter who will join forces with the majority. Freedom is what is sought; and immunity from restraint does not carry with it any compulsion either way.

However, the issue of the report has enabled us to complete in to-day's issue our summary of the evidence, and to make (for publication next week) a selection from the appendices. The additional matter is so extensive, and it includes such a variety of subjects, that we cannot usefully refer to it all in an editorial comment. Two matters of current interest to the industry may, however, be mentioned. It will be seen that Mr. Otto Hehner has supplemented, by further experiments, the research of himself and Dr. Samuel Rideal on the question of the sulphur content of the air of gas-lighted rooms. Their former report on the subject upset the theorists, and those who thought Science was completely satisfied by crude physiological tests. The complementary tests have satisfied Mr. Hehner as to the accuracy of the former conclusions of himself and Dr. Rideal. This further examination into the matter was conducted in the one case under more stringent conditions—with ceilings and walls papered and varnished, and the room made as nearly air-tight as human ingenuity could devise, and the other with the conditions relaxed to those obtaining in an ordinary living-room. It is, in view of the attacks which have been made on these experimenters and their tests, extremely gratifying to find Mr. Hehner sums up his more recent testimony by saying: "I am perfectly satisfied from "these experiments that, even in a comparatively air-tight "room with non-absorbent walls, it is impossible to increase "the sulphur content of the air materially beyond the sulphur "content of the outside air. Sulphur acids are clearly "thrown into the air of the room by the combustion of coal "gas, but they are removed as soon as formed. The removal "of the sulphur compounds appears to be effected in three "ways: By ventilation, by the alkaline materials of the walls "and the ceilings, and by condensation." These are potent statements.

The evidence that has resulted from this investigation should be highly valuable to sanitarians and architects; for there is conclusive proof in it that the varnishing of walls and ceilings of a room has the effect of materially decreasing ventilation, and therefore of conducing to an unwholesome condition of the atmosphere. The gas industry will not forget that the credit attaching to the new light thrown upon this sulphur question is due to the suggestion of Sir George Livesey, and that the expense of it was borne by the South Metropolitan Gas Company. As to the second point to which we wish to direct attention. It is found in a table in the additional evidence of Sir George; and it proves that the saving effected by the South Metropolitan Company, through their reduction of the illuminating power, is considerably under ½d. per candle. These are two of the features of the further interesting matter which the report of the evidence has produced. Though the Committee's report, in one or two respects, does not meet with universal approval, there is no doubt that their inquiry has been productive of much valuable investigation and opinion which will make a deep impression on, and influence very materially, the future course of the industry.

Glasgow Gas Department Accounts.

We are able in this issue of the "Journal" to give the report of the Gas Committee of the Glasgow Corporation, and a summary of the accounts of the Department for the past financial year. Perhaps the most remarkable feature of the accounts is the small balance of £61 which has resulted on the year's working. Four years ago, there was a deficit of £55,000 on the year, which led to the retention of the price of gas at 2s. 6d. per 1000 cubic feet. The result was a surplus of £39,000, which was followed in the succeeding year with another surplus, amounting to £48,000. These two sums sufficed to wipe out the deficit, and left about £33,000 in hand. Accordingly, when the estimates for the year just closed were being considered, it was felt that the Corporation could, with safety, sail much closer to the wind than they had been doing; and they made a big reduction in the price of gas. So near a result was possibly not in their minds; but it is satisfactory to find that in their calculations they did not overshoot the mark, but that, on the contrary, they have scored a decided hit. The elasticity of their business was doubtless taken into account; and though this is the most elusive factor in all businesses, the prescience of those who gauged it has been fully justified. Without a large increase of business, the accounts would have closed on the wrong side; but the increase which was expected has been realized, and a surplus has been earned, which, although small, is sufficient. It is, moreover, more satisfactory than a large one, in respect that it exercises less disturbance upon the general finances.

The great increase in the output of gas—210 million cubic feet—was produced from 540 tons of coal less; and along with this there was the large quantity of 11,146 tons of coke less produced, which would seem to indicate a change of working. For this lessened quantity of coke there was, however, an increase of £3864 in the revenue derived from it. The question arises whether the shortage in the supply was the reason for the enhanced price. Whether it was so or not, it will be of interest to many managers in the Glasgow area to find that they are having less competition to meet in the coke market than they have had. The other principal item of revenue—the ammoniacal liquor and tar—went down by £22,891. This was due to market influences, which are less amenable to management than is the coke market. Probably the fall was foreseen and discounted. Had it been less than it was, the surplus would have been greater; and here there may have been provided some room for play upon the estimates. If so, the result has come out so near that it is impossible to withhold admiration for the policy. There was a saving of over £23,000 upon coal, which was an item that could have been foreseen and reckoned upon; and it was mainly responsible for the reduction of £25,449 in the charges for the manufacture of gas. But in the coal account, there was this notable feature—that the yield of gas per ton was 304 cubic feet more than it had been before, which, again, has probably something to do with the coke account. On the whole, the accounts show that admirable business talent is being displayed in the conduct of this gigantic business, and that it is no haphazard which brings the balance out one way or another.

If, in the works department, the undertaking is all that can be desired, the same can be said, without reservation of any kind, regarding the financial department. It is only of late years that a policy of reducing the annuities account has been taken up. While other sources of debt were being wiped out, these were holding their place as a permanent burden—and a heavy burden, too—upon the undertaking; the rates payable being £9 and £6 15s. per cent. Now under a scheme of conversion which is altogether voluntary, and by the operation of the sinking fund, the yearly charge has been reduced from £415,000 to £276,000; and there is a prospect of the indebtedness which is being created under the conversion scheme being got rid of, by redemption, after the year 1921. It is nearly ten years since the Corporation completed their policy (begun many years before) of raising money otherwise than by mortgage. Since then the aim has been to have only one creditor, and that themselves. The concentration of the capital fund in the hands of the Corporation has been an accomplished fact since 1896. The benefit is to be found in this—that, whereas the rate of interest for money raised by mortgage was 4 per cent., Corporation loans are obtained at £3 4s. per cent. A saving of 16s. per cent. annually is of immense advantage to a borrower who holds loans to the amount of nearly a million and a half sterling. In some quarters the belief is entertained that facilities for obtaining money lead to recklessness in spending. But any tendency to be lavish can only be kept in check by the common sense of the spender; and it may be frankly confessed that the free hand with public money is not unknown in places where money is not easily obtained. The most essential of all elements in Corporation finance is business capacity; and the body which originates so advantageous a scheme as this is for the community of Glasgow, may be relied upon not to be wasteful of the funds at their disposal. This is what is being found in practice. Money is being spent; but it is judiciously spent. The proof of this is to be found in the continued low rates which are charged for gas, notwithstanding the large capital expenditure of the past few years. The Provan works, which are to be opened next week, have cost nearly £700,000; and yet the price of gas is lower than it has ever been before. The Gas Committee, it will be observed, propose further borrowing powers to the extent of £1,000,000, so as to meet the cost of works in course of erection or in

contemplation. Judging by the past, it may certainly be depended upon that the Committee see their way clear for the profitable expenditure of this further capital. The undertaking never was in a healthier condition than it is at present, which is, in itself, sufficient reason for going forward. It is also amply sufficient reason upon which to extend to all concerned the heartiest of congratulations, and this we do most cordially.

The Consolidation of Gas Undertakings.

THE consolidation of industrial enterprise is a question of the age; and in several branches of industry the benefits to the public through the concentration of management and supervision, the ability of large consolidated concerns to buy, dispose, and convey material with greater facility and economy than comparatively small units, and the resulting cheapening of the production—are well recognized and generally conceded. But, of course, it depends primarily upon the nature of the business, secondly upon the ability of those who undertake the administration, and thirdly as to whether their object is the single one of the greatest personal and proprietary gain or the ultimate mutual benefit of suppliers and consumers, whether consolidation is a thing to be desired from the point of view of the latter. The question of competition may also come in. If the character of a business is such that, by consolidation, competition in the supply of a necessary of life is closed down, unless the consolidation be accompanied by legislative control, then there is little doubt that the effect will be destructive to the interests of consumers. This has been seen in connection with some of the monster trusts—the creations of modern times; and shareholders, too, to their chagrin and distress, have found that all these trusts have not turned out, through over-capitalization or some other reason, exactly as had been hoped for and predicted. Experience has not brought any general rule in this matter in its application to gas supply. Cases where consolidation has been beneficial, and cases where it has not been, will occur to most readers. But there can be no two questions that gas supply can be, given (we emphasize this) proper management, conducted in a single district with greater economy than where the supply is split up into small units. But the difficulty is to be sure of the proper administration, and of the non-existence of purely selfish ends on the part of the promoters of concentration. Therefore, we say, no opinion, or rule of action, can be based alone on the experience of the past as to whether the principle of consolidation would in all cases be beneficial to gas consumers; and, consequently, before pronouncing any view which one could claim as invincible, it would be necessary to examine most scrupulously every proposal of the kind, and all the surrounding conditions.

In a paper that Mr. John Martin read before the Pacific Coast Gas Association in July last, on the subject of "The Benefits of Consolidation as applied to Small Gas "Companies," he appears to think that amalgamation of small gas undertakings under one head is the panacea for all the ills from which the customers of such concerns suffer. America—through Mr. Shelton, Mr. Martin, and other men of great capacity and discernment in the gas business—has shown the benefits of such amalgamation to both consumers and those who supply the substance in the way of capital for producing it; but, with others at the head, it is equally possible that the consumers might not as such have experienced any betterment in their position. So that success in these cases is no assurance that success would follow in other instances. It is easy to lay down the conditions that are necessary to produce advantageous results, assuming that those conditions are exercised in the manner that has proved so beneficial in certain cases in America and this country. Mr. Martin states them, although not so tersely as here. They are commercial resource, the free investment of capital to eradicate the old order of things and to instal the new so as to cheapen and economize, the immediate and liberal reduction of price on consolidation, inducements to use gas on the most economical and efficient lines, the provision of central offices, the command of good engineering skill and the brightest intellects which a small undertaking cannot always afford, and the savings accruing from the centralization in management and the dealings in materials. These all count in the making of success for consolidation; but if there is an absence of, or declension in, any one of the principal of these, the advantageous effects of consolidation would not accrue. The only index of success from such concentration that would appeal to us would be the improvement in the position of the consumer in the matter of price; and that has not always followed, though, we repeat, Mr. Shelton and others in America and certain undertakings in this country have produced good and lasting benefit for those who patronize them. On the whole, therefore, it can be concluded that every proposal for consolidation must be judged on its merits.

There is still another consideration from the technical point of view. America has proved, and this country has not been without its examples, that combination (here we are referring to larger undertakings) does not always tend to advancement in method—manufacturing and commercial. Energy is not always sustained; and there is a tendency for methods to become fossilized and for conservatism to govern. One form of management, of regulation, of system, streams through the whole of the undertakings brought under such dominion; and this often saps vitality, hinders progress, and bars the exercise of the inventive gifts of those in subordinate positions. Opportunity cannot be obtained; encouragement is not only wanting, but a suggestion of a new idea is merely frowned upon. Thank goodness this does not apply to all gas undertakings which have become large by amalgamation in this country and America; but in both countries, the finger can be placed on instances of this inherent weakness in consolidation. The good old maxim, therefore, that "Unity is Strength" is not always unassailable.

Coal Production and Consumption.

DURING the past week there was issued by the Board of Trade the usual tables relating to the production, consumption, and imports of coal in the British Empire and the principal foreign countries for 1903, with particulars, as far as possible, for the preceding ten years. Those who have a liking for statistical investigation can have a large amount of satisfaction from this report for a very trifling expenditure. The first thing that strikes one is that, while there was an increase in 1903 in the production of the five principal coal-yielding countries of the world, the difference on the preceding year in the case of the United Kingdom is not so marked as in the cases of Germany, France, and the United States. The figures for the year were: United Kingdom, 230,334,000 tons; Germany, 116,638,000 metric tons; France, 34,318,000 metric tons; Belgium, 23,912,000 metric tons; and United States, 320,983,000 tons. The comparative figures (metric tons where just stated) for the preceding year were: United Kingdom, 227,095,000 tons; Germany, 107,474,000 tons; France, 29,365,000 tons; Belgium, 22,877,000 tons; and United States, 269,277,000 tons. Therefore the production of the United States exceeds that of the United Kingdom; but the production of Germany represents only about a half, and that of France and Belgium together about a quarter, of the output of this country. The total known coal production of the world (exclusive of brown coal or lignite) is about 790 million tons a year, of which the United Kingdom yields rather less, and the United States rather more, than a third.

The average value per ton of the coal produced taken at the collieries, in the five above-mentioned countries, in 1902, was: United Kingdom, 8s. 2¾d.; Germany, 8s. 10¼d.; France, 11s. 8¾d.; Belgium, 10s. 6¾d.; and the United States, 5s. 8¼d. These prices represent a fall of about 1s. 2d. per ton in the United Kingdom, of 6d. per ton in Germany, 11d. per ton in France, and 1s. 8d. per ton in Belgium, but a rise of 2d. per ton in the United States. The provisional figures available for the year 1903 indicate a further fall of 7d. per ton in the United Kingdom, and 3d. per ton in Germany, while in the United States there has been a further rise of 10d. per ton. A glance at one of the tables shows that the average value of coal in this country has now nearly returned to the level of 1889. Of course, it must be borne in mind that many circumstances, such as the quality of the coal mined, improved machinery, nearness to surface, the nature of the soil, &c., affect the average value at the collieries, in addition to any difference there may be in the cost of labour. The coal exports of this country increased in 1903 by about 3,405,000 tons—the actual export being 63,805,000 tons. As a set-off against this, there was only an import of 3000 tons, which is precisely the same as in the previous year. There was little

difference in the consumption of coal in the country in 1903 compared with 1902—the total being 166,532,000 tons, or a reduction of 166,000 tons.

The report also includes statistics as to the production and exports of petroleum in Russia and the United States. It is remarked that in 1902 (the figures for 1903 are not available yet) the total production of the United States was 3106 million gallons; while the Baku oil-fields of Russia (which are accountable for the major part of the production of the country) yielded 3016 million gallons in 1902 and 2460 million gallons in 1903. The last figure is a considerable drop. The statistics also show that the quantity exported from Russia is much less than that from the United States. These are some of the conspicuous features of the returns which those interested largely—as are gas managers—in the movements of the coal industry, will find instructive.

Co-Operation in Preparing a Gas Encyclopædia.

The proposed development of the work already done by the Ohio Gaslight Association in connection with their "Question-Box" into something on the lines of an encyclopædia for gas engineers, was the subject of an article in the "JOURNAL" for the 2nd ult. In that article we advocated the co-operation in the work of British gas engineers, in order that it might be done on lines so comprehensive as to be of mutual value to the profession in all English-speaking countries. There is not in existence such a work as the one contemplated; and it appeared to us that, if proper steps were taken, means might be found whereby the work of compilation, revision, and extension, as well as the expense and benefits, might be shared on both sides of the water. What the Ohio Gaslight Association are now intending to do through their Revision Committee may be in the future what British gas engineers would like done for them; and why not take the opportunity now of avoiding a duplication of work and expense by the suggested co-operation? We are naturally pleased to learn from Dr. Harrop, the Chairman of the Ohio Revision Committee, that the article alluded to has given him satisfaction, and that the proposal that the undertaking should further develop into an international work fully meets with the approval of himself and his associates in the matter. It appears that the possibility of co-operation with British gas men had not escaped the Committee's notice, and that they had recognized the advantage of such joint work—"appreciating the mutual benefit which would accrue to the workers on both sides of the water." But, in their modesty, they have "scarcely dared to suggest it."

The First Steps.

Now, however, that the suggestion has been made, is the time for someone to follow it up. The first step which must be taken should, of course, be either by a communication to the Institution of Gas Engineers from Dr. Harrop, or else from the Institution to that gentleman. A communication, too, from him to the British District Gas Associations calling attention to the proposal as set out in the article in question, and requesting them to consider the matter, and, if favourable, to urge upon the Council of the Institution the advantage of the gas engineers of this country being identified with the work, would help to hasten the matter to a decision. Individual members of the gas profession might also like to make known their views on the subject. If the matter is taken up, then the outlining of a plan of co-operation should not be difficult. The idea on the face seems to us to be feasible. To Dr. Harrop and his colleagues, it also appears so; and we hope, when they finally set to work, they will have had the hand of co-operation and enterprise extended to them from this country. The decision on the subject will be urgently needed; but a plan of co-operation could be evolved with greater leisure. And it must not be overlooked that it is not a matter in which advances and negotiations should be looked for from America; rather they should come from this side. The suggestion must, in fine, be regarded in this country from the point of view of an excellent opportunity for participating in a great and beneficial work for the gas professions in both countries; and those professions have *never yet combined* in any effort having for its end technical advancement.

Lighting and Advertising the Earl's Court Exhibition.

Firms who are trading in high-power incandescent gas lighting systems will have a fine opportunity for showing what they can do at the forthcoming International Gas Exhibition. The Organizing Managers are, as will be seen in another part of this issue, inviting proposals; and those that are suitable, and are received by the 21st inst., will have the space available apportioned among them at an early date. There will be no charge made for the space; but, of course, there are certain conditions attaching to the acceptance of schemes. The buildings and ground space that have been taken for the purposes of the exhibition are admirably adapted for making a grand display of the efficiency of high-power gas systems for lighting streets, open spaces, and large halls; and the illumination of the principal entrance will likewise give a good opening for the exercise of enterprise. Electricity is also to be found at Earl's Court; and if the Committee can arrange for a demonstration bringing the comparative lighting effect and cost strikingly before the public, this would be a feature of undoubted great value. The Chairman of the Advisory Committee (Mr. J. W. Helps) need not be reminded of the similar and effective demonstrations he was able to make in connection with interior lighting at his own Exhibition some time since at Croydon. Special steps, however, should be taken to give the public information, by boldly printed notices, as to the name of the system whose light they may be inspecting, the candle power per lamp, and the cost per hour. The Committee are stipulating that each exhibitor shall have a stand in the exhibition at which such particulars can be obtained; but the general public will not go searching about for information and asking questions unless they are immediately in want of what is seen—anyway, that is the opinion formed from a fairly intimate experience of exhibitions of a smaller order. However, here is the opportunity for a display of gas lighting on a magnificent scale; and we shall be surprised if the competition for allotments of space is not a keen one, and if the firms interested do not rise well to the occasion. The subject of advertising the Exhibition by gas companies and gas-supplying authorities may again be mentioned. The reference to the matter last week has brought from Mr. C. W. Braine a notice, prominently printed and displayed on half sheets of note-paper, which the Wandsworth and Putney Gas Company are now enclosing with all letters, receipts, &c., and one of which will be delivered to every consumer with his next quarterly account. The notice is headed with the name of the Company, and then reads: "International Gas Exhibition, Earl's Court, Nov. 19 to Dec. 17, 1904. The attention of gas consumers and others is directed to this important exhibition, which will show every variety of appliance for the use of gas for lighting, cooking, and heating, motive power, industrial purposes, &c." "With the compliments of the Wandsworth and Putney Gas Company" appears on the other side.

Carburetted Water Gas.

The controversy on this subject aroused by the circular of the Board of the South Suburban Gas Company to their consumers is of a somewhat spasmodic kind. Perhaps the word "controversy" is hardly the correct term; for in controversy there must be two contending parties. In this instance, however, the circular was issued, and the statements it contained were publicly repeated by Sir George Livesey; but the attacks made upon those statements elicit no reply. Sir George seems to be taking it all with stoical indifference; and the attitude he has adopted is no doubt that set forth in the opening paragraph of the short letter he addressed to the "JOURNAL" on July 26, in which he said: "I have no ground for controversy with my friend Mr. Helps, who has as much right to proclaim his enthusiasm for water gas as the Crystal Palace District Gas Company's Board have to set forth its disadvantages, as they find them, in a circular to the gas consumers." After the matchless life's work that Sir George has given to the gas industry, with every action fearlessly laid bare, there can, of course, be but few who would think otherwise than that, in this particular matter, he has stated his opinions with perfect honesty, and that he, on the other hand, believes that those who disagree with him do the same. There are, however, in the circular assertions respecting carburetted water gas which are fair subjects for temperate discussion and the statement of experience. In our "Correspondence" columns, Mr. A. M. Paddon

has to-day put before readers some of the aspects of the case for carburetted water gas, and has cited experience to controvert certain of the statements in the South Suburban circular. He has done this with exemplary taste, if the ugly word "disengenuousness" be excepted.

The Utilization of Gas Coke;

If there has been one thing more than another upon which the inhabitants of most large towns have been in agreement, it is that the great bore of their existence is smoke, with its attendant fog. For years well-meaning people have exerted themselves to the utmost, by every possible device, to diminish the nuisance caused by the discharge, from the thousands of chimney-pots of this, and other great cities, of the black, foul-smelling vapour which is so frequently seen emerging from them. One of the most forcible of the gas manager's arguments when advocating the use of gaseous fuel is that each gas-stove employed for culinary or heating purposes will, if to only a slight extent, help forward the good work of freeing the atmosphere from the smoke which now contaminates it. Should he be unsuccessful in convincing his listener of the value of gas, he tries what he can do in the way of praising coke—a residual of gas manufacture which, in the opinion of many, has not been sufficiently utilized as a heating agent. Among them is Herr Stack, of Hanover, who directed attention to the subject in a paper read at the meeting in that city last June of the German Association of Gas and Water Engineers. The general scope of the paper was noticed in the "JOURNAL" at the time; and to-day we give a full abstract of it. Herr Stack suggests to gas managers that, by a little preliminary treatment of the coal before carbonization, the resultant coke could be made much more valuable as a fuel, and that its general consumption for domestic purposes would have the effect of improving the atmosphere of our cities and towns. Last week, in a brief paragraph (p. 595), we directed attention to a paper read by M. Boscheron, of Liége, before the Belgian Gas Association, on "Heating by Coke," in which the use of this material is advocated for its quality of smokelessness.

And the Hygienic Value of Smoke.

It seems, however, that the efforts of these gentlemen and all other workers in the field of smoke abatement have been misdirected. Smoke a nuisance? Certainly not. It is an inestimable boon for which Londoners should be thankful. At least so Mr. Heather Bigg told the readers of the "Morning Post" in a letter which appeared a fortnight ago. As a member of the medical profession, it may be presumed that he thoroughly understands what he is writing about; and he declares that the fact of London being the healthiest big town in the world is due "entirely to the smoke that is discharged into its atmosphere." This smoke, with its attendant "blacks"—the despair of the cleanly housekeeper—is in reality a "hygienic treasure" which, far from fouling the atmosphere, "purges it from fevered malignancy" discharged from the sewer-gas pipes attached to the houses. Mr. Heather Bigg thinks that it is probably because these gaseous and murderous poisons, as he calls them, are invisible that they escape the "unkindly attention" which is paid to the really philanthropic soot! And not only is the air improved by the presence of smoke, but also the water, that huge "poison factory" known in former times as the limpid Thames—the gentle gliding of which "at his own sweet will" touched the heart of the Poet of Nature—but now one vast open sewer, would, we are told, be spreading poison to the inhabitants on its banks, were it not for the "soots" that persistently descend to its surface. We should have scarcely thought that they would have fallen in such numbers as to have any appreciable effect on such a bulk of water; but we are doubtless mistaken. Mr. Heather Bigg admits that the smoke of London may be unpleasant in its murky disguise. At the same he claims for it the high position of "the greatest sanitary blessing we possess." Consequently, he suggests that those who so devoutly wish its abatement would do wisely to reconsider their desire, on the grounds he has given. To persist in their efforts might, we presume, be followed by some dire calamity such as that which fell upon the Ancient Mariner when he shot the albatross. We are inclined to think, however, that the majority of people will be on the side of the noble army of smoke abaters. The heart may, after all, be on the right side; but we shall require proof of it from more than one doctor before we are convinced that it is.

DEATH OF MR. EDWARD DRORY.

IT is with inexpressible sorrow that we have to announce the death of Mr. Edward Drory, the Chief Engineer at Berlin of the Imperial Continental Gas Association. The sad event occurred last Friday night; and it was only as we were going to press yesterday that Mr. R. W. Wilson, the Secretary of the Association, was able to convey to us the painful intelligence. Death was due to heart failure. For several years now, Mr. Drory has been suffering from some form of cardiac affection; and this has been a source of grave anxiety both to himself and his friends—more especially as his health of recent years has been so indifferent that it has necessitated occasionally the suspension of professional work, and visits to health resorts or abroad in search of recuperation. He was unable to be present at the June meeting of the German Gas Association, much to the expressed regret of his fellow-members; and even then the reports which reached Hanover as to the condition of his health were such that they caused his many friends the greatest solicitude.

Though health, in the last few years, has been against him, Mr. Drory's professional work has by no means suffered. He was an engineer of great gifts; and he lived in and for his work, and ever threw into it—excepting when ill-health removed him from it—the energy of an enthusiast. No truer words were ever spoken of a man than those uttered by Mr. Horsley Palmer (then Deputy-Chairman, now Chairman) at the meeting of the Imperial Continental Gas Association in November, 1902. "There was," he said, "no more skilful Engineer on the Continent, or more devoted servant of the Association, than Mr. Edward Drory, their Chief Engineer at Berlin. He was an acknowledged expert throughout Germany; and when any difficulty arose at gas-works, Mr. Drory was frequently consulted, so that the trouble might be righted." That is true. No patronymic is honoured more among the gas engineers of Germany than that of Drory. The life of Edward Drory, his work, and his example have carried their influence into the many works and many men's lives in that country. Where he was, there was to be found the centre of much engineering activity—if not always in actual constructional work, in investigation and experiment. Not only in Germany, but in other countries, his ability has left its marks behind.

The greatest of his works was, of course, Mariendorf. There he brought into being the fruits of his research and experience; and the great central feature of these works was the inclined retort-house, upon which system of carbonization he had spent much time and thought, and of which he became an ardent advocate. That house has been the object of pilgrimages of engineers from all parts of the world, and its working has been the subject of, we believe we may say, universal satisfaction; so much so that its replica is now being built in New York, and on a smaller scale another is already erected in Plymouth. Mariendorf reminds us of the contributions of Mr. Drory to the pages of the "JOURNAL," chief among which were the articles describing the great works which were published in the early part of this year. But great as those works are, they only form the first section, which was carried out between April, 1900, and October, 1901; and before Mr. Drory died, he saw the commencement of the second section.

Among other contributions for which we and our readers have been indebted to Mr. Drory, were his exhaustive statement in 1902 on the subject of retort-house working in Berlin, and the illustrated article on "Retort-Houses for Inclined Settings and their Development." In addition, he entered very freely into the controversy of that year in the "JOURNAL" on the inclined system. Among his other work has been the investigation which has been proceeding now for some months into the vertical retort system at Mariendorf; and latterly into the question of the self-carburation of water gas.

Mr. Drory was a man whom to know was to love. His colleagues of the Imperial Continental Gas Association will mourn his loss. He was the friend of all; and the light of their circle. The funeral takes place to-morrow.

Binding Material for Briquettes.—A recent number of the "Zeitschrift für angewandte Chemie" contained a paper on the estimation of binding material in coal briquettes. It is shown therein that the proportion of the pitch mixed with the coal before moulding greatly affects the physical character of the briquettes. If too little is used, they are friable and liable to break into powder; if too much, they may be too soft. The examination of 33 samples of pitch used for this purpose showed that their solubility in carbon disulphide varied from 60 to 91 per cent., and had an average value of 76 per cent. The material employed as a binding material in the manufacture of briquettes is almost invariably coal-tar pitch, and the effective constituent of it is that portion which is soluble in carbon disulphide. The method to be employed in ascertaining the amount of binding material consists, therefore, in simply extracting 10 grammes of an average sample of the briquettes with carbon disulphide in a Soxhlet apparatus, and weighing the residue, or the extracted matter. Should it be desired to subsequently determine approximately the amount of pitch added, the figure thus obtained must be divided by 0·76.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 679.)

BUSINESS in general on the Stock Exchange last week was on a very limited scale. For one thing, it was a five-day week—the Exchange being closed on Saturday. Then, the first half of it was mainly devoted to the settlement of the nineteen-day account. It, however, went through smoothly, and without giving rise to any apparent difficulties. Fresh business was consequently very quiet indeed; but, in spite of this, the general tendency was favourable, and prices in most lines had a modest advance. Public nervousness regarding possible international complications was abating, but was not sufficiently advanced to bring in a mob of buyers from the outside. In the Money Market, there was the normal demand in connection with the Stock Exchange and the ordinary month-end requirements; but when this came to an end, the abundant supply produced a position of great ease. Discount rates also eased perceptibly. In the Gas Market, business was certainly quieter than it was in mid-August—on some days particularly so; but now and then it would take a start, as if it were going to accomplish great things—only to relapse into quietude again. There were very few changes in quotation (except those arising from *ex div.* adjustment, which were numerous enough), but they were all in the upward direction. Apart from these, however, and where the quotations did not actually rise, the marked prices were good and the general tendency was very firm. In Gaslight and Coke issues, the ordinary was moderately dealt in daily at the same figures as in the week before; and the best price (93¾) was done on the closing day. The secured issues were very quiet; the maximum and preference changing hands only once, but at nice prices. South Metropolitan had a quiet time after its recent activity, but was firm—marking 125¾ at the close. Commercials had a fractional improvement on being quoted *ex div.* The Suburban and Provincial group had their fair share of what business was going. Alliance had a good rise. The old stock changed hands at 20½—the best figures touched for a long time past. Several other companies came out at better figures on *ex div.* changes, the particulars of which will be seen in our list. Among the Continental Companies, Imperial was the most active, especially on Wednesday. There were a few dealings in Union; the ordinary changing hands at the low price of 102. Dealings in undertakings located in the remoter world offered nothing much to call for notice, except a rise in Bombay. The shares in this Company take a distinguished rank among investments when the return they yield for money is regarded.

The daily operations were too level to call for further detail. The changes were: On Tuesday, Alliance and Dublin new rose ¼; and on Thursday, ditto old rose ½. On Friday, Bombay old rose ¼.

ELECTRIC LIGHTING MEMORANDA.

A Hasty Decision at Wrexham—An Electrical Expert on Gas—Electrical Engineering Concerns on the Continent.

WITH all sincerity, we ask the Wrexham Town Council to pause and reconsider, and make a complete investigation into, the matter of the resolution they hastily passed at their last meeting, committing the borough to a wasteful scheme of incandescent electric lighting in the streets. The Council, it appears, have invested £30,000 in their electricity undertaking; and they are at their wits' end now for means of cultivating new business, so as to make the concern remunerative. In their distraction (we will not use a stronger term), they have decided to adopt the questionable expedient of compelling the ratepayers to further patronize the undertaking by extending the street lighting by electricity in a manner which, municipal opinion generally declares, is unwise through its expensiveness in relation to efficiency in comparison with incandescent gas lighting. In other words, because the undertaking is not prosperous, and is a burden, they are going to increase the burden by making the ratepayers pay more for less illumination than can be more readily obtained by another method of lighting. The Council were elected to defend the interests of the ratepayers; but we assert that their present proposal, if carried out, will be an abandonment of that duty. It is not sound financial policy to increase the burden on the one hand in order to make the finances on the other look better, and that is what the Council are doing. Their electricity undertaking has been running for some years; but, even now, the revenue only amounts to a total of about £4000—£1000 for public lighting, £1270 for the supply to the Tramways Company at 2d. per unit, (the average cost to the Corporation is 2¼d.), and £1700 from private consumers. This is not in accordance with the preliminary estimated prosperity; and so not long since the Electricity Committee advised that there should be an extension of the distribution system, and that a scheme of electric arc lighting should be adopted. The expense rather scared the Council; and they requested the Committee to reconsider the project, which the Electricity Committee and their Engineer, it appears, were at the time confident was the "best" that could be conceived.

The Committee visited Chester, and—wonderful to relate!—came back with their former convictions completely changed, as they had seen there "suburban portions, including side streets and alleys," lighted by incandescent electric lamps—"gas being entirely dispensed with." Thereupon they got out a new estimate for a scheme of incandescent electric lighting, supplemented by a small number of arc lamps, which it is reckoned will produce a reduction in the former estimate of between £1400 and £1500. This now is the "best" scheme. Our comment upon it is that the Committee have arrived at this decision on insufficient evidence, and that they are doing an injustice to the ratepayers by not producing a statement as to the annual cost of the proposed system and the illumination which will be afforded in comparison with incandescent gas lighting. We suggest to them that their investigation will not be complete until they have studied the series of articles in the "JOURNAL" on "The Public Lights of London," published in February last. In them, among much other information, they will find that the City and Borough Councils in the 118½ square miles of the Metropolis have, out of 6159 electric lamps, only 1185 of the incandescent type; and, instead of extending on that system, they are, as a rule, fast completing the street lighting on the incandescent gas system, even where they are in possession of the electricity undertakings, to the end that (from the returns supplied to us by the Borough Surveyors themselves) there were at the beginning of this year 56,690 incandescent gas-lamps in the streets of London, and that number has since been largely extended. These are facts gathered from a much more extensive ground than Chester, and bearing greater authority. Because of this, and our knowledge of the costs of the various systems of lighting in London and the illumination obtained by them, we ask the Wrexham Town Council to pause, and reconsider their decision.

The "Ironmonger" boasts an "electrical expert" as an occasional contributor; but we cannot bring ourselves to the point at which we can conscientiously compliment our contemporary on this special possession, if we may take as a fair example the quality of an article on "Electricity or Gas" which he has contributed to its pages this week. The Editor of the "Ironmonger" himself is not altogether sure of his "expert," for there is a note prefacing the article which warns the reader to take what follows *cum grano salis*—anyway, that is the only meaning we can attach to the editorial words: "The writer may be pardoned if he takes a somewhat extreme view of the case." We will give the writer credit for being honest when he states that light for light the cost is in favour of the older illuminant. Electrical experts are gradually coming round to the sensible view that it is puerile to continue kicking against hard facts. It is quite as foolish as swearing that black is white, when electricity consumers, wherever one goes, turn up their accounts, and point to the fact that they have been paying (say) treble what they had previously done for incandescent gas lighting, and have not been enjoying any greater illumination. There is one other matter on which the "expert" of our contemporary makes an admission which is not generally conceded by electricians. He says: "We are compelled to admit that for street lighting gas seems to hold the field at present." We can heartily support him in that expression of opinion.

Then the expert goes on to write a bit too assertively on the question of gas-flames using up the "oxygen or vital constituents" of the air, and other matters. Readers of his effusion, even those without scientific training, will marvel how the expert accounts for gas-flames being able to exist in a room after having fiercely gone on depleting the stock of oxygen in the manner he pictures, or how it is that the majority of us are here at all to read what he has written, seeing that our grandfathers and fathers were in the habit of living in rooms in which the oxygen-consuming and poisonous flat-flame was constantly burning after dusk, and in a far cruder fashion than that in which gas is now burned. Our contemporary's expert asserts that the incandescent gas-burner is greedier after oxygen than the old batswing burner. Supposing it is, has it not occurred to him that one incandescent burner in a room will give as much light as, roughly speaking, half-a-dozen of the old flat-flame burners? He also declares that the incandescent gas-burner gives off products of combustion in the shape of poisonous gases as well as a certain amount of moisture, and that these gases have a most insidious effect, not only on the human being, but on surrounding objects of all descriptions. "It may be truly affirmed," he further adds, "that a person who habitually works and lives in a gas-lit atmosphere never enjoys his full meed of health and energy." We would suggest that this expert before he continues writing in this strain should read up the evidence on these matters given before the recent Board of Trade Committee on the Testing of Gas in the Metropolis, and pay particular heed to how men of science—"expert" in medical and chemical questions—failed to prove to the Committee that gas was answerable for all the sins that this "electrical expert" attributes to it. It was a pity that these men of high scientific degree did not consult the writer in the "Ironmonger" before they appeared before the Committee. However, we suppose as the Editor has asked readers to do so, that we must "pardon" the writer for his extreme views—and (may we not say?) indiscretions.

Just recently we commented upon the unprosperous condition of the electrical engineering concerns in this country, owing to over-competition. On the Continent, the industry appears to be, speaking generally, in no better case, though several firms have been picking up a little financially during the past year. In

Germany, there are instances of concerns that paid no dividends during the two years preceding the last; but an improvement in net profits has enabled them to pay for the past year a small dividend, though only about sufficient to raise the hope of shareholders that a better state of things is in store for them. Other concerns have not even this little piece of good luck. The returns of two or three Swiss companies show slightly improved financial results; while a French company whose figures are published ended their last year's working with a deficit exceeding that of 1902. There is a Russian company showing up very well; but they supply the exception to the rule. Still—again speaking only generally—the amount of work going in Continental countries seems to have been fairly plentiful; but it must be assumed that, as in this country, it was not plentiful enough to keep all profitably employed who were prepared to take it up.

SERVICE WITH A COMPANY OR A CORPORATION—WHICH IS BEST?

THE valuable advice and the outspoken remarks to the Urban District Council of Bishop's Stortford by Sir George Livesey, on a recent occasion, serve to remind us of the unworthy views respecting their officials prevalent among a certain class of municipal enthusiasts. It goes without saying that, among members of elected bodies, there are diversities of talents and of business capacity, as well as a similar variety in the intelligence of the ratepayers who elect, and largely direct the policy of, their representatives. Unfortunately, there is no machinery in existence whereby the ultimate effects of any policy can be summed up and made clear to the minds of people unaccustomed to the problems of large-scale business operations. The result is that any upstart claiming municipal honours, however ignorant he may be, has an equal chance of acceptance at the poll as, and in some cases a better one than, a modest and capable man. Nor does the unfair advantage of the noisy novice always terminate on the day of election; it frequently happens that the unsound views loudly and persistently proclaimed are not always held in check by a combined opposition of those who know better.

It is considerations such as these that, in practice, spoil the operation of what would, on paper, appear an ideal scheme—viz., that of municipal ownership of gas undertakings. Many of the factors that cause the ideal to be lamentably defective in its realization, are apparent upon the surface; but there are others, due to the extreme party political spirit, that can only be known to those acquainted with the machinations of the "caucus." The uncertainty of office, the changes in the constitution of committees, the personal animosities of men of like or unlike party designation, are all reckoned upon in the ordinary estimation of the intrinsic worth of municipal control; but they must often, it is to be feared, be supplemented by the mysterious, but nevertheless real, effect of the party wire-pullers. It is not perhaps to be considered as a surprise that ill-informed ratepayers should vote as they do, when public teachers so often misinterpret the facts concerning municipal trading and management. When "black" is made into "white," and inferences are being drawn therefrom with remorseless logic, the only conclusion that can be arrived at must, of necessity, be widely separated from the truth.

As an instance of such fallacious and plausible methods, we cannot perhaps do better than quote from the published views of Mr. Bernard Shaw, in "The Common Sense of Municipal Trading," issued in anticipation of the last election of the London County Council. Although Mr. Shaw appears to be free from the oft-expressed opinion of many Labour Leaders and Socialists, that no official is worth more than a very limited annual salary, yet he is under the impression that the service of a municipality is to be preferred to that of a company. What may be the verdict so far as relates to gas undertakings, we leave confidently to the judgment of our readers. The point of view of Mr. Shaw will be understood by the following extracts:—

CHAP. II., Page 9.—"Municipal Management: The importance of management as a factor in industrial success cannot easily be exaggerated; but management is nowadays as completely dissociated from ownership, and as easy to buy in the market, as machinery."

Page 10.—"The labour market now includes an ability market in which a manager worth £10,000 a year can be hired as certainly as a navvy. In the ability markets, the municipalities have a decisive advantage in the superior attraction of public appointments for prudent and capable organizers and administrators. A municipality can always get an official more cheaply than a company can. A municipality never becomes bankrupt; is never superseded by a new discovery; and never dismisses an official without giving his case prolonged consideration in committee, from which he has practically an appeal to the whole body. A man who behaves himself, and does his work, has nothing to fear in public employment; his income and position are permanently assured. Besides, he enjoys his salary to the full; he has no appearance to keep up beyond the ordinary decencies of life; he need not entertain; need not keep equipages or servantsf or purposes of ostentation; may travel third-class if he likes. It is no exaggeration to say that these considerations make a municipal post of £350 a year more desirable than some commercial posts and professional practices that bring in £1000 a year; and this is why the ratepayers, in spite of their stinginess in the matter of salaries on the professional scale, get so much better served than they deserve."

Page 11.—"All that can be said on the other side is that, if the municipal officer has no fears, he has also strictly limited hopes."

Page 12.—"On the whole, then, when the direction of a joint-stock company on the one hand, and the representatives of the ratepayers on the other—both being alike 'amateurs carrying on business with other people's money'—come into the market to engage an executive staff, the municipality has the advantage of its competitor. It can get its management cheaper as certainly as it can get its capital cheaper."

The writer, whom we have quoted at such length, has, we believe, failed entirely to grasp the facts upon which he so ingenuously discourses; and his interpretation of the facts is, we doubt not, quite different from those that many of our readers would make—fortified by their intimate acquaintance with the subject.

WORKMEN'S COMPENSATION STATISTICS.

THE Home Office last week issued their statistics of proceedings during the year 1903 under the Workmen's Compensation Acts, 1897 and 1900, and the Employers' Liability Act, 1880. These have been prepared on similar lines to those dealing with the preceding year; and it is again pointed out that, as the statutes referred to contain no provision for the making of returns to show the working of the systems of compensation which they established, the statistics of necessity leave untouched the great bulk of payments arising under the Acts. In the majority of instances, of course, the question of compensation is settled by agreement, and no memorandum is registered. No official information is therefore available, as employers of labour are under no obligation to supply returns of the cases in which they have paid sums of money in regard to accidents. Thus the sources from which particulars are compiled are limited to the cases coming before the County Courts, registered agreements or awards by private Arbitrators, actions carried to appeal, official references to Medical Referees, and certified schemes of compensation.

The first table shows that the number of cases under the Workmen's Compensation Acts dealt with in England and Wales by County Court Judges and Arbitrators was 1437. This is the largest number yet recorded; the totals for the four previous years having been 999, 1145, 1370, and 1269 respectively. Of these, 1295 were decided by Judges, 50 by Special Arbitrators, and 92 were settled by acceptance of money paid into Court. In addition, there were 596 cases which were withdrawn, settled out of Court, or otherwise disposed of in such a way as not to enable the officials to state definitely the results. This, again, is a considerably higher figure than in any of the preceding four years. Of claims for compensation which were finally settled within the cognizance of the Courts, the decision in 960 cases was in favour of the applicant, and in 178 in favour of the respondent. Thus in 84 per cent. of the cases the applicant was successful, as against 75 per cent. in 1899. In 446 instances the award was a lump sum, and in 514 a weekly payment. In no less than 324 cases compensation was awarded on account of death; and in all of them, with one exception, the deceased had left dependants. The total amount so awarded reached the really substantial figure of £58,530—a considerable increase on the previous year. The average award was £180 13s., which has only been exceeded in one year—in 1901, when it was £188 7s. 7d. With regard to the grants for injury, there were 122 cases (as compared with 96 in 1902) in which the compensation was returned as consisting of a lump sum. In 35 instances the plaintiff accepted money paid into Court; and in the majority of the remainder a lump sum was apparently awarded by consent of the parties. The average amount was £27 18s. 3d. In 512 cases of injury (285 of total and 227 of partial incapacity) a weekly sum was assigned; the average allowance for partial incapacity being 10s. 6d., and for total incapacity 12s. 1d.

Turning to the Employers' Liability Act, there were 513 County Court cases in 1903 (as against 548 the previous year); and in 125 of these judgment was for the plaintiff, in 95 for the defendant, while 293 were otherwise disposed of. The total amount of damages awarded was £13,247, as compared with only £9330 in 1902, when there was apparently a larger number of successful claims. In 35 of the 513 cases, though the proceedings were originally taken under the Employers' Liability Act, the question of compensation was actually determined under the Workmen's Compensation Act, in accordance with the power given. In the year under review, the average amount of damages in case of death amounted to £246 5s. 3d. under the Employers' Liability Act, and (as already mentioned) to the very much smaller sum of £180 13s. under the Workmen's Compensation Act. This is a complete reversal of the figures for the preceding twelve months, which were £115 7s. 10d. and £168 0s. 1d. respectively. It is, however, pointed out that the increase in the average amount under the Employers' Liability Act on the present occasion is accounted for by the heavy damages awarded in three cases in the Dudley County Court, which amounted to £2025. There is still a marked tendency in the Metropolitan Courts to proceed under the Employers' Liability Act, in preference to the newer statute.

The number of cases under the Workmen's Compensation Acts carried to the Court of Appeal in England was 38, or a little more than 2 per cent. of the actions that came before the County Courts—a considerable decrease as compared with the preceding years. Of these cases, 18 were appeals by workmen and 20 by

employers; the former scoring nine successes, as against three by the latter. There were two appeals to the House of Lords; the workman being the appellant in one case, and the employer in the other. Here, again, the workman's appeal was allowed, while that of the employer was dismissed. Speaking generally, the returns do not indicate any great change in the operation of the Acts. As compared with 1902, the past year shows an increase in the number of cases taken into Court; but, of course, the great majority of claims continued to be settled by agreement. Even in the event of death, where large sums were in question, not more than 22 per cent. of the cases came in any way before the Courts; and of these many were finally settled, while there were others in which the only point was the apportionment of the compensation among the dependants. As regards claims for injury, unofficial figures available in certain industries indicate that the number of litigated cases is not more than 1 per cent. of those in which compensation is payable.

The principal feature of the Scotch returns is a decided decrease in the number of cases taken into Court under the Workmen's Compensation Acts, as compared with 1899; the proportion per million of the population being now smaller than in England. On the other hand, the amount of litigation under the Employers' Liability Act still remains greater in Scotland.

Waverley Association of Gas Managers.—Under the presidency of Mr. James Gemmel, the local Gas Manager, the 87th half-yearly meeting of this Association will be held at Melrose on Thursday. The business to be transacted consists of an address by the President, and subsequent discussion of any of the topics that he may deal with which specially appeal to the members present as needing elucidation.

Recent Progress in Large Gas-Engines.—In publishing a list of six rolling mills on the Continent which are driven by gas-engines of 1000-horse power and over, the "Iron and Coal Trades Review" remarks that it appears there are now built, or building, under the Deutz, Körting, Nuremberg, Oechelhaeuser, and Cockerill patents over eighty engines of this power and upwards, and amounting to over 107,000-horse power in the aggregate. The majority run from 1000 to 1200 horse power; but some are as large as 3200-horse power, as in the case of those of the Nuremberg type supplied to the Rheinische steel-works and the Röchling works for blowing-engines.

The Late Mr. Lewis Thompson's Bequest to Byker (Newcastle).—Some of our readers may remember that the late Mr. Lewis Thompson, whose name figures conspicuously in the early volumes of the "JOURNAL," left a sum of £15,000, the interest on which was to be devoted to diminishing the poor-rate of the Byker township of Newcastle-on-Tyne, in which city his last days were spent. A curious condition was attached to the bequest. Every year, on the 17th of August, the anniversary of his sister's death, a wreath must be placed on his father's grave in Jesmond Old Cemetery. Neglect of this ceremony for three years in succession means the loss of the money to the township. But it has been faithfully carried out every year since, and the amount so far received is £6540 12s. In the presence of several prominent citizens, the wreath was duly placed on the grave on the 17th ult.

Use of Tar in Road Making.—Referring to this subject, on which an article appeared in a recent number of the "JOURNAL," the "Journal des Usines à Gaz" asks whether, supposing the tarring of roads became general in France, the demand could be met in that country. It may be taken for granted that French gas-works will very soon carbonize 3 million metric tons of coal, producing 150,000 tons of tar; while coke-works, in coking 2 million tons, will contribute at least 50,000 tons. Taking the average width of the roads to be 6 metres, and 1·2 kilos. of tar to be used per square metre (which seems a great deal with liquid tar), it would require 7200 kilos. per kilometre of road; and the 200,000 tons of tar would suffice for about 30,000 kilometres. Whatever the advantages of tar may be, our contemporary thinks it will be a long time before this length of French roads are treated in the way described.

The "Perfect" Gas-Engine Starter.—The current number of the "Engineer" contains an illustrated description of the "Perfect" starting apparatus for gas and oil engines, which is manufactured by the Sheffield Engineers, Limited. The construction is simple; the only internal working part being a steel ball-valve. To start the engine, the crank is placed in such a position that all the valves are closed; and a screw plug on the top of the starter is then removed, and the ball pressed down with a prober, which is supplied with the appliance. The required quantity of benzoline or petrol is then poured into a funnel-shaped reservoir, and by it passed through a projecting pipe into the cylinder end; and the funnel pipe is twisted out of the way. The fly-wheel is then moved a little forward, in order to draw in the requisite amount of air through the starter. By bringing the crank nearly back to its original position, compression is obtained, and the ball is forced back on to its seating. The prober is again used to press down the ball, until it falls by its own weight; and then, by placing a lighted match over the hole in the starter, the engine is started without further manipulation. The screw-plug is thereupon replaced. The quantity of benzoline required is small; being, it is stated, about a thimbleful to start a 50-horse engine, and about half the quantity for one of 10-horse power.

SOME LESSONS FROM "FIELD'S ANALYSIS."

Coal and Working Expenses: High Profits and Low Prices for Gas.

By H. E. JONES, M.Inst.C.E.

The following particulars from "Field's Analysis" may be interesting. There have been extracted the figures of five of the leading undertakings in the analysis for the year 1903—showing excellence in various points.

Taking as the first point of excellence—the supply of gas at a low price—it is gratifying to see how over the whole range of Metropolitan and Suburban companies, Provincial corporations, and Provincial companies, the price of gas is steadily falling toward 2s. per 1000 cubic feet.

TABLE A.—AVERAGE PRICE OF GAS PER 1000 CUBIC FEET.

Metropolitan and Suburban Companies.

1. South Metropolitan	2s. 2·47d.,	since reduced by	3d.	per	1000.
2. Wandsworth	2s. 3·74d.,	"	2d.	"	
3. Commercial	2s. 5·23d.,	"	1d.	"	
4. Crystal Palace	2s. 6·86d.,	"	1d.	"	
5. Croydon	2s. 8·39d.,	"	*		

Provincial Corporations.		*Provincial Companies.*	
1. Bradford	2s. 0·38d.	1. Plymouth	1s. 8·97d.
2. Birmingham	2s. 2·57d.	2. Sheffield	1s. 9·57d.
3. Oldham	2s. 2·60d.	3. Newcastle	1s. 9·91d.
4. Carlisle	2s. 3·43d.	4. Bristol	2s. 2·78d.
5. Glasgow	2s. 3·77d.	5. Bath	2s. 3·41d.

TABLE B.—PROFIT MADE ON CAPITAL RAISED.

Metropolitan and Suburban Companies.

1. Commercial	10·83	per cent. at	2s.	5¼d.	per 1000.
2. Wandsworth	9·60	"	2s.	3¾d.	"
3. Croydon	9·46	"	2s.	8¼d.	"
4. Mitcham	9·45	"	3s.	8d.	"
5. South Metropolitan	8·79	"	2s.	2½d.	"
6. Brentford	8·73	"	2s.	10¾d.	"

The price of gas at 3s. 8d. in the case of the Mitcham Gas Company displaces it from the fourth position of credit.

Provincial Corporations.

1. Carlisle	16·85	per cent. at	2s.	3¼d.	per 1000.
2. Manchester	10·36	"	2s.	9¼d.	"
3. Glasgow	10·30	"	2s.	3¾d.	"
4. Salford	9·24	"	2s.	6¾d.	"
5. Leicester	8·61	"	2s.	4¼d.	"

The high price of gas at Manchester, again, displaces it from the second position of credit.

Provincial Companies.

1. Sheffield	12·03	per cent. at	1s.	9½d.	per 1000.
2. Portsea	10·20	"	2s.	6d.	"
3. Rochester	9·80	"	2s.	5¾d.	"
4. Brighton	8·25	"	3s.	0¼d.	"
5. Bath	7·86	"	2s.	3¼d.	"

If making a high profit at a low price for gas be kept as a standard, then the order in the above groups would be much varied—Wandsworth would be the first and the South Metropolitan the second of the first group. Carlisle would be the first and Glasgow the second of the second group. Bath would be the fourth and Brighton the fifth of the last group.

That the highest profits are chiefly made by undertakings making the lowest charge for profit per 1000 cubic feet, and are no tax upon the consumer, is shown by the next comparison.

TABLE C.

Metropolitan and Suburban Companies.

1. Wandsworth	charge for profit	8·32d.	per 1000	to earn	9·60	p.c.
2. Crystal Palace	"	8·88d.	"	"	8·62	"
3. South Metropolitan	"	9·27d.	"	"	8·79	"
4. Tottenham	"	9·89d.	"	"	8·47	"
5. Richmond	"	9·93d.	"	"	8·10	"
6. Commercial	"	10·69d.	"	"	10·83	"

If the dividend were brought down to the same level as the Wandsworth, the Commercial would be second on the list.

Provincial Corporations.

1. Birmingham	charge for profit	7·24d.	per 1000	to earn	6·60	p.c.
2. Bradford	"	7·33d.	"	"	5·17	"
3. Oldham	"	7·75d.	"	"	6·50	"
4. Carlisle	"	8·43d.	"	"	16·85	"
5. Glasgow	"	8·55d.	"	"	10·30	"

If Carlisle and Glasgow were brought down to the same dividends as Bradford, they would be first and second in order.

Provincial Companies.

1. Rochester	charge for profit	3·33d.	per 1000	to earn	9·80	p.c.
2. Plymouth	"	6·02d.	"	"	7·19	"
3. Portsea	"	7·76d.	"	"	10·20	"
4. Bath	"	9·24d.	"	"	7·86	"
5. Bristol	"	9·70d.	"	"	7·41	"

* A differential price exists in Carshalton; but this, through a reduction of 3d. made this year, is now only 3d., and this will be altogether abolished before long.

There may be circumstances in the case of Rochester explaining its exceptional position.

The reasons for the highest percentages on capital being earned at the lowest price of gas, are manifold. Certainly, the chief of them is the ratio of capital to output. Thus we find from

TABLE D.

Metropolitan and Suburban Companies.

1.	Wandsworth is the lowest at	7s.	10d.	of capital per 1000.
2.	Commercial	8s.	9d.	„ „
3.	South Metropolitan	8s.	10d.	„ „
4.	Crystal Palace	9s.	3d.	„ „
5.	Tottenham	10s.	2d.	„ „
6.	Richmond (without carburetted water gas)	10s.	3d.	„ „

Those Companies depending largely on carburetted water gas will naturally have a lower capital expenditure per 1000; and if there were a correction made for this point, the South Metropolitan would be second on the list and Richmond fifth.

Provincial Corporations.

1.	Glasgow is the lowest at	6s.	11d.	of capital per 1000.
2.	Birmingham	9s.	2d.	„ „
3.	Oldham	9s.	7d.	„ „
4.	Carlisle	10s.	3d.	„ „
5.	Bradford	11s.	10d.	„ „

Bradford in 1900 was only 7s. 5d. for capital per 1000; so there must be some circumstances specially accounting for this.

Provincial Companies.

1.	Rochester is the lowest at	2s.	10d.	of capital per 1000.
2.	Portsea	6s.	11d.	„ „
3.	Sheffield	7s.	0d.	„ „
4.	Plymouth	7s.	6d.	„ „
5.	Bath	10s.	2d.	„ „
6.	Bristol	11s.	1d.	„ „

Here again there must be some special feature about the Rochester undertaking.

Having dealt with A, the low average price of gas; B, the high profit on capital raised; C, the low charge upon the gas which the high profit on capital occasions; D, the ratio of capital to output—we come to another charge, which varies greatly and is in a sense also a capital charge—viz., rates, which are based on the earnings necessary to pay interest on capital.

TABLE E.

Metropolitan and Suburban Companies.

1.	Wandsworth	at 1·16d.	per 1000.
2.	Richmond	„ 1·40d.	„
3.	Crystal Palace	„ 1·44d.	„
4.	Tottenham	„ 1·46d.	„
5.	South Metropolitan	„ 1·57d.	„
6.	Commercial	„ 1·59d.	„

Provincial Corporations.

1.	Glasgow	at 0·12d.	per 1000.
2.	Carlisle	„ 0·46d.	„
3.	Oldham	„ 1·38d.	„
4.	Birmingham	„ 1·51d.	„
5.	Edinburgh	„ 1·64d.	„

Provincial Companies.

1.	Plymouth	at 0·62d.	per 1000.
2.	Newcastle	„ 0·90d.	„
3.	Portsea	„ 0·93d.	„
4.	Bristol	„ 1·13d.	„
5.	Rochester	„ 1·51d.	„

We next come to the net cost for coal and working expenses; and necessarily in these figures those undertakings having direct access to the coal-fields, and working on a large scale of operations, have a great advantage. I am not surprised, therefore, to find the results shown in

TABLE F.

Metropolitan and Suburban.

1.	South Metropolitan is the first at	19·33d.	per 1000.
2.	Commercial	„ 20·66d.	„
3.	Gaslight and Coke	„ 22·45d.	„
4.	Wandsworth	„ 23·44d.	„
5.	Croydon	„ 23·87d.	„
6.	Crystal Palace	„ 23·91d.	„

Provincial Corporations.

1.	Bolton	17·18d.	per 1000.
2.	Leicester	17·19d.	„
3.	Bradford	17·57d.	„
4.	Salford	17·69d.	„
5.	Oldham	19·21d.	„

Provincial Companies.

1.	Sheffield	13·00d.	per 1000.
2.	Newcastle	13·52d.	„
3.	Plymouth	16·69d.	„
4.	Bristol	18·22d.	„
5.	Bath	21·03d.	„

The explanation of these last figures (which are made up of many detail charges and with sales deducted) is most interesting, and will be followed up later. But this last table, like the earlier ones, illustrates in a general way careful attention to the management of the working as well as in the management of the capital expenditure.

GAS PURIFICATION BY AMMONIACAL LIQUOR.

By THOMAS HOLGATE, F.C.S., M.Inst.C.E.

(*Continued from p.* 604.)

REVIVIFICATION OR PURIFICATION OF AMMONIACAL LIQUOR.

These last considerations bring us to the point where we may inquire how the ammoniacal liquor may be revivified, and at what cost; as it is evident that, with any given proportion of ammonia to acid gases, two courses are open: (1) A minimum quantity of liquor may be purified, and it may be re-circulated through the scrubbers, so as to secure maximum absorption. (2) A larger quantity of liquor may be purified, and it may be re-circulated through the scrubbers, so as to secure medium absorption. There are cases, where the acid gases are exceptionally high, where the best features of each course may advantageously be combined—*i.e.*, the maximum absorption with a large quantity of purified liquor.

The principles involved in the purification of ammoniacal liquor have been foreshadowed in what has gone before—viz., the compounds of ammonia with sulphuretted hydrogen and carbonic acid are split up into ammonia and acids at a temperature below 200° Fahr.; the ammonia being held in solution at this temperature, while the carbonic acid and sulphuretted hydrogen are liberated. The action is not complete in either direction, but is so ample that, after the treatment and subsequent cooling, the activity of the purified liquor is nearly fivefold that of the unpurified. This increased activity is obtained even in a liquor which has not been fully purified, as the following analyses will show. The figures given in Table X., published last week, relate to the samples headed (*g*) and (*h*) in Table VIII. (*ante*, p. 601), which show a lesser degree of purification than samples (*c*) and (*d*) in the same table.

The unpurified liquor is shown to be supersaturated 10 per cent., while the purified is undersaturated 44·79 per cent. What amount of work on crude gas each of these can do will depend upon the maximum absorption that is possible. That recorded by Mr. Lewis T. Wright showed 21·33 per cent. of supersaturation; and as this is the highest known to the writer, it is here assumed as the maximum. Upon this basis the unpurified liquor would be able to take up 21·33 − 10 = 11·33 H.E., while the purified would be capable of 21·33 + 44·79 = 66·12 H.E. However, as the former contained 78·5 H.E., and the latter 65·25 H.E. of ammonia, a larger volume of the latter must be circulated—

$$\frac{78{\cdot}5 \times 11{\cdot}33}{65{\cdot}25 \times 66{\cdot}12} = \frac{889}{4314} = 1 : 4{\cdot}85$$

as the activity for equal volumes of liquor.

Comparing this purified liquor with the Nottingham liquor *before* its passage through the liquor scrubber, its relative activity is 3·1; and seeing that the latter abstracted from the gas in the scrubber 8·78 per cent. of the acid gases generated or 9·39 per cent. of those admitted to the scrubber, then one unit of purified liquor might be expected to remove 8·78 × 3·1 = 27·22 or 9·39 × 3·1 = 29·11 per cent. on the respective basis of calculation. Allowing for the diminution of ammonia content, 6 gallons of purified liquor would be required to take the place of 5 gallons of unpurified; and seeing that 81·24 per cent. of the acids (see Table IXA., *ante*, p. 602) remained to be removed in the purifiers, the following calculation will show that at least 3·58 units of liquor (viz., 23 gallons), or 82 gallons per ton of coal, would have needed revivification.

27·22 p.ct. : 81·24 p.ct. : : 1·20 : 3·58. 23 × 3·58 = 82 gallons.

This quantity of liquor represents what is necessary with a moderately well purified liquor, thoroughly well utilized, on a scale of absorption equal to the Nottingham standard; but in the calculations of the heat required to effect revivification, as given in the next paragraph, 100 gallons will be taken.

HEAT REQUIRED FOR REVIVIFICATION OF LIQUOR.

The heating of the 100 gallons of liquor per ton of coal carbonized, from 60° Fahr. to 200° Fahr., may be accomplished by direct fire, as in a boiler, or by live steam, by exhaust steam, or by the waste gases from a sulphate of ammonia saturator. The quantity of heat to be provided will be 100 gallons × 10 lbs. × 140° = 140,000 B.T.U. If the heat were supplied through live or exhaust steam, 1 lb. would furnish 1100 B.T.U., a quantity evaporated by 12 lbs. of coke—*e.g.*, $\frac{140{,}000}{1100} = 127$ lbs. of steam. The cost of this fuel, at 10s. per ton $= \frac{120\text{d.} \times 12 \text{ lbs.}}{2240 \text{ lbs.}} = 0{\cdot}64\text{d.}$ But if the liquor purified be used to warm up the liquor to be purified, then the fuel account becomes 60° × 100 gallons × 10 lbs. = 60,000 B.T.U., or 58 lbs. of steam, costing in 5 lbs. of coke $\frac{120\text{d.} \times 5 \text{ lbs.}}{2240} = 0{\cdot}27\text{d.}$ However, in practice, the cost of fuel is *nil*, because in most gas-works exhaust steam is available, and where sulphate of ammonia stills are at work it is found that the waste gases from the saturator are more than sufficient for the heating required. In the latter case, what occurs is that the waste gases, instead of being condensed, without useful application of the heat, prior to passing into the oxide purifier Claus kiln, or

sulphuric acid plant, are used to accomplish the purification of ammoniacal liquor.

The method adopted by the writer was described in a paper which he read before the Institution of Gas Engineers at the annual meeting held in London in 1895; and the results now to be given are from the plant there referred to, and operated at the Halifax Gas-Works. An essential feature is that while the ammonia is nearly all retained in the liquor, the small quantity liberated is absorbed by the sulphuric acid in the saturator through which the mixed gases, carbonic acid, sulphuretted hydrogen, and steam pass. The liquor, having been deprived of its acid gases at 200° Fahr., is then made to flow in a contrary direction to the liquor *en route* for purification, thereby becoming reduced to 100° Fahr.; and the latter is raised to 140° Fahr. as a minimum, and then the purified liquor, by passing through the cooling-pipes, is further reduced to 60° Fahr. If the cooling-pipes require the aid of water flowing on their exterior surfaces, this water may be that which would have been required in the waste gas condenser from the sulphate of ammonia still, or it may be that which is afterwards to be used in the retort-house for coke quenching. The temperature of the water after use will be below 100° Fahr., and probably not more than 90° Fahr.; so that it is quite serviceable in the manner suggested. The cost of cooling water thus becomes that of the pumping from one part of the works to another. This cost and that of repairs and interest on capital are all the charges that come against the revivification of ammoniacal liquor; and they are of insignificant amount. The total cost is such that the removal of 1 per cent. of carbonic acid from gas is equal to 0·024d., against 0·1875d. for lime, per 1000 cubic feet; the latter being based upon 2 lbs. of lime at 12s. 6d. per ton, and labour at 5s. per ton, and not including anything for the removal of the spent lime.

Use of Purified or Revivified Liquor.

In the paper submitted by the writer to the Institution of Gas Engineers, particulars were furnished of the degree of purification of the liquor treated in the plant there described, and figures were given showing that with a certain washer 16·1 of the acid gases were removed by the unpurified, and 39·8 per cent. by the purified liquor. If the impurities removed by a Laycock and Clapham washer following that washer be added, the figure for unpurified liquor is increased by 2·66 per cent., making the total removal 18·76 per cent. This, on comparison with Table XI., and remembering the smaller impurity in the latter crude gas, may be considered as quite up to average good working. Tables XIA., XIB., and XIC. are to show the increased figures when using purified liquor, in conjunction with an additional 13,500 cubic feet of scrubbers, and especially when the circulation was increased by more efficient pumping. With 63 strokes per minute, there was removed the high percentage by volume of 74·54 per cent. of the acid gases which removal was 3·463—a quantity considerably in excess of that contained in ordinary crude gas.

It is important to note the high percentage of carbonic acid in the Halifax crude gas, due to the use of cannel hub. This was accompanied by a rather smaller yield of ammonia than with ordinary coal, which latter gave above the average amount of sulphuretted hydrogen. This fact will be again referred to when dealing with the financial results of carbonization and gas purification. Tables XIA. and XIC. show how the purification of the gas changes with the character of the ammoniacal liquor employed,

Table XI.—*Percentages by Volume in Gas.*

—	Entering Scrubbers.			Leaving Scrubbers.			Removed by Liquor Purification.	
	CO_2	H_2S	Total.	CO_2	H_2S.	Total.	Total.	Per Cent.
Average with Durham coal	1·50	1·20	2·70	1·12	1·04	2·16	0·54	20·00
Do. where cyanogen is abstracted with ammonia in first washer . .	2·15	1·73	3·88	1·96	1·65	3·61	0·27	7·00

Table XIA.—*Working Results at the Halifax Gas-Works (West Yorkshire Coal and Cannel Hub Carbonized).*

1896.		Deg. Twad.							
Aug. 20 . .	Purified	1·75	4·000	0·581	4·581	1·780	nil	1·780	2·801	61·15
,, 21 . .	,,	1·75	4·338	2·070	6·408	1 988	0·460	2·448	3·960	61·79
,, 22 . .	,,	1·75	5·090	1·211	6·301	2·240	0·061	2·301	4·000	63·48
	Average	1·75	4·476	1·287	5·763	2·003	0·174	2·176	3 587	62·25
Aug. 24 . .		2·75	3·980	0·968	4·948	2·169	0·726	2·895	2·053	41·49
,, 25 . .	Liquor gradually increasing in saturation.	2·75	4·049	1·271	5·320	2·687	0·400	3·087	2·233	41·97
,, 26 . .		3·00	4·085	1·453	5·538	2·410	1·247	3·657	1·881	33·96
,, 27 . .		3·00	3·976	1·489	5·465	2·904	1·307	4·211	1·254	22·95
,, 31 . .		3·00	3·010	1·332	4·342	2 130	1·065	3·195	1·147	26·42
Sept. 1 . .		3·00	3 370	1·307	4·677	2·190	0·944	3·134	1·543	32·99
,, 2 . .		3·00	3·458	1·695	5·153	2·543	1·150	3·693	1·460	28·33
,, 3 . .		3·50	2·868	1·671	4·539	2·398	1·029	3·427	1·112	24·50
,, 4 . .		3·75	2·832	1·453	4·285	2 145	1·090	3·235	1·050	24·50

After Aug. 22, liquor was circulated that had previously been purified. The increasing density shown by the degrees Twaddel indicates the progression of saturation, and this is coincident with diminished absorption.

Table XIB.

—		Number of Strokes per Minute.	—	CO_2 and H_2S.	—	CO_2 and H_2S.	—	
1902.								
Feb. 24 . .	Purified.	44	Quantity of gas passing per hour greater than in Table IIA which latter was 50,000 cub. ft.	3·658	..	1·762	1·896	51·83
,, 28 . .	,,	56		4·153	..	1·167	2·986	71·90
March 2 . .	,,	58		4·418	..	1·159	3 259	73·76
,, 13 . .	Not freshly purified	60		4·251	Liquor had been previously circulated, after purification.	1·458	2·793	65 70
,, 15 . .	Purified	61	Part of washer not working.	4·484	..	1·155	3·329	74·20
,, 20 . .	,,	60		4·267	..	1·443	2·824	66·18
,, 20 . .	,,	59	..	4·380	..	1·231	3·149	71·89
,, 28 . .	,,	62	..	4·724	..	1·287	3·437	72·75
,, 29 . .	,,	63	..	4·646	..	1·183	3·463	74·54

Purified liquor run into washer and then pumped into scrubbers. These tests show the effect of increased circulation, as indicated by the number of strokes of the pump.

Table XIC.

1900.		Deg. Twad.							
Aug. 17 . .	Partly saturated	..	2·90	3·10	6·00	2·40	2·30	4 70	1·30	21·60
,, 20 . .	,,	3·75	2·87	2·75	5·62	1·86	2·20	4·06	1·56	27·80
,, 30 . .	Freshly purified and a little unpurified	2·80 4·20	2·60	2 85	5·45	0 70	1·60	2·30	3·15	57·80

while Table XIB. reveals the importance of the scrubber being amply supplied with the active agent. The quantity of liquor purified and circulated in these tests was not measured; but it is believed that the average was not less than four times the normal quantity. The volume of gas passed through in mid-winter would be a maximum of 100,000 cubic feet per hour. The plant was in section No. 2 of the gas-works, which in the year made about 75 per cent. of the total output of the undertaking. The gas was treated with purified liquor, except when the Claus kiln required emptying, or when other stoppages occurred due to the usual repairs in a plant not in duplicate.

That the figure given on the first line of Table XI. does not understate the average of good working where unpurified liquor is used, may be seen by reference to the following figures, calculated from data given by Mr. Clement Hovey in the "JOURNAL," see Vol. LXXXVI., p. 299. They represent the work done in a series of the small vertical scrubbers erected at the new gas-works, Tynemouth, upon the model of those erected by the South Metropolitan Gas Company at their Bankside station, to the designs of the Chief Engineer, Mr. Charles Carpenter. The cross section was increased in the case of those at North Shields, being relatively double that of the prototype. The dimensions of each series are given in the "JOURNAL" for Oct. 6, 1903 (p. 42). The total quantity of liquor pumped through the scrubbers amounted to 260 gallons per ton of coal carbonized, and was therefore of ample magnitude.

TABLE XII.

Percentages by Volume in Gas.	Entering Scrubbers.			Leaving Scrubbers.			Removed by Liquor Purification.	
	CO_2.	H_2S.	Total.	CO_2.	H_2S.	Total.	Total.	Per Cent.
Unpurified liquor .	1·41	1·03	2·44	1·12	0·95	2·07	0·37	15·2

These results and those given in Tables XI. to XIc. show that while the extent and the efficiency of the scrubbers and washers are important factors, the prime factor is the relative activity of the liquor circulated.

SAVING IN COST OF GAS PURIFICATION.

When using purified ammoniacal liquor, the saving will depend to some extent upon the method adopted for dealing with the waste gases from the saturator. Without considering how the carbon dioxide may possibly be made use of, there are three methods for utilizing the sulphuretted hydrogen: (*a*) Absorption by oxide of iron in boxes open to the atmosphere; (*b*) by conversion into flowers of sulphur through a Claus kiln; and (*c*) by conversion into sulphuric acid through the burning into sulphur dioxide at the usual "burners" for spent oxide or pyrites. The last method (*c*) appears to be the most profitable; but any one of the three is better than sending the sulphuretted hydrogen gas into the ordinary purifiers. The results now to be given were obtained under the second system.

The gases from coal and carburetted water gas were both freed from sulphuretted hydrogen and carbonic acid, and no air was admitted to the crude gas before or at the purifiers. There were no separate boxes for the removal of sulphocarbons, but the proportion present was less in the finished gas when purified ammoniacal liquor was employed in the scrubbers. This result was, no doubt, brought about by the diminished percentage of carbonic acid in the gas entering the boxes having a smaller disturbing effect upon any calcium sulphide present. The figures given are from the published accounts of the Halifax Corporation Gas-Works. They represent the cost of purification of all the gas made each year; but purified liquor was only applied to section No. 2, as already explained.

For some time after the commencement of carburetted water gas manufacture, that gas was not washed with ammoniacal liquor; but in the last year it was washed with liquor which, having been purified, had done work in section No. 2, and was almost saturated before being pumped into the scrubbers, through which mixed gas, and sometimes water gas alone, were passed. During the same period only two purifiers were available, owing to the transition state of the works. These circumstances and the fact that carburetted water gas does not contain any ammonia and that its largest impurity is carbon dioxide—the one most costly to remove—render impossible the comparison after 1900 with the years before. Purified ammoniacal liquor was first employed in November, 1893, and was gradually brought more into use and more effectively applied. The first complete financial year was the one ending at March 31, 1895. The comparisons

TABLE XIII.—*Details of Cost of Purification of Gas at the Halifax Gas-Works.*

Year ended March 31.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.
Wages	£1,080	£859	£659	£895	£922	£753	£611	£817	£780	£673	£809
Lime	1,012	909	888	965	958	828	850	789	1,051	1,130	1,044
Spent Lime—credit	80	74	48	33	..	21	21	..	..	..	..
,, ,, debit	..	..	..	..	19	..	..	77	178	148	236
Oxide of iron—credit	520	..	90	159	300	302	275	472	360	see foot note.	402
,, ,, debit	..	120	..	..	..	..	..	..	..	67	..
Brimstone—credit	..	60	207	192	194	212	13	156	85	151	79
Net cost of purification	£1,492	£1,754	£1,202	£1,476	£1,400	£1,046	£1,152	£1,055	£1,565	£1,867	£1,608
Gas purified, thousands	645,252	640,159	682,359	721,525	749,916	774,650	826,387	862,842	870,152	872,214	876,131
Carburetted water gas per cent. (estimated)	..	..	..	..	..	..	..	..	9·79	13·63	6·37
Illuminating power . . . candles	18·12	17·92	17·61	17·51	18·52	18·45	18·37	17·62	17·75	18·47	18·05
Lime used . . . tons	1,617	1,458	1,418	1,546	1,476	1,345	1,361	1,125¾	1,450	1,664	1,575
Do. per 1000 c. ft. of gas purified . . . lbs.	5·61	5·12	4·65	4·79	4·41	3·88	3·68	2·92	3·73	4·27	4·02
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Do. price per ton	12 6¾	12 5¾	12 6	12 6	12 6½	12 3¾	12 6	14 0¼	14 6	13 7	13 3
Do. for spent lime sales—credit.	1 0	1 0¼	0 8	0 5	..	0 3¾	0 3¾	..	..	..	..
Do. and removal—debit	..	..	..	..	0 3	..	..	1 4½	2 5½	1 9½	3 0
Do. including removal	11 6¾	11 5½	11 10	12 1	12 9½	12 0	12 2¼	15 4¾	16 11½	15 4½	16 3
Estimated wages on lime section at 5s. per ton of lime.	£405	£364	£355	£386	£369	£336	£340	£281	£362	£416	£394
Lime as above, *plus* estimated wages	1,417	1,273	1,243	1,351	1,322	1,164	1,190	1,070	1,413	1,546	1,438
Do. per 1000 c. ft. purified	0·527d.	0·477d.	0·438d.	0·449d.	0·423d.	0·360d.	0·346d.	0·296d.	0·389d.	0·425d.	0·394d.
Estimated wages on oxide section, by difference	£675	£495	£304	£509	£553	£417	£271	£536	£418	£257	£415
Oxide of iron and brimstone—credit	520	..	297	351	494	514	288	628	445	84	481
As above—debit	..	60	..	..	..	..	..	..	..	..	..
Wages and materials, oxide section	£155	£555	£7	£158	£59	gain. £97	gain. £17	gain. £92	gain. £27	£173	gain. £66
Oxide section—loss per 1000 cubic feet purified	0·057d.	0·208d.	0·002d.	0·052d	0·019d.	..	..	..	..	0·047d.	..
Do.—gain do.	..	..	..	..	..	0·030d.	0·005d.	0·025d.	0·007d.	..	0·019d.
Cost of purification, excluding spent lime do.	0·584	0·685	0·440	0·501	0·442	0·330	0·341	0·272	0·382	0·473	0·375
Do., do., calculating all lime at 12s. 6d. per ton, do.	0·583	0·685	0·440	0·501	0·440	0·333	0·341	0·248	0·342	0·452	0·359
Net cost of purification, including receipts or expenditure on spent lime . { per 1000 c. ft. purified.	0·558	0·657	0·423	0·491	0·449	0·324	0·334	0·294	0·431	0·512	0·440
Net cost of purification, including receipts or expenditure on spent lime . { per 1000 c. ft. sold.	0·600	0·716	0·461	0·533	0·491	0·353	0·363	0·318	0·466	0·554	0·476

Mem.—As to oxide of iron for the years 1901 and 1902, by an error of bookkeeping, a sum of £300 became transposed as to its year. The corrected figures are given the total cost not being affected thereby.

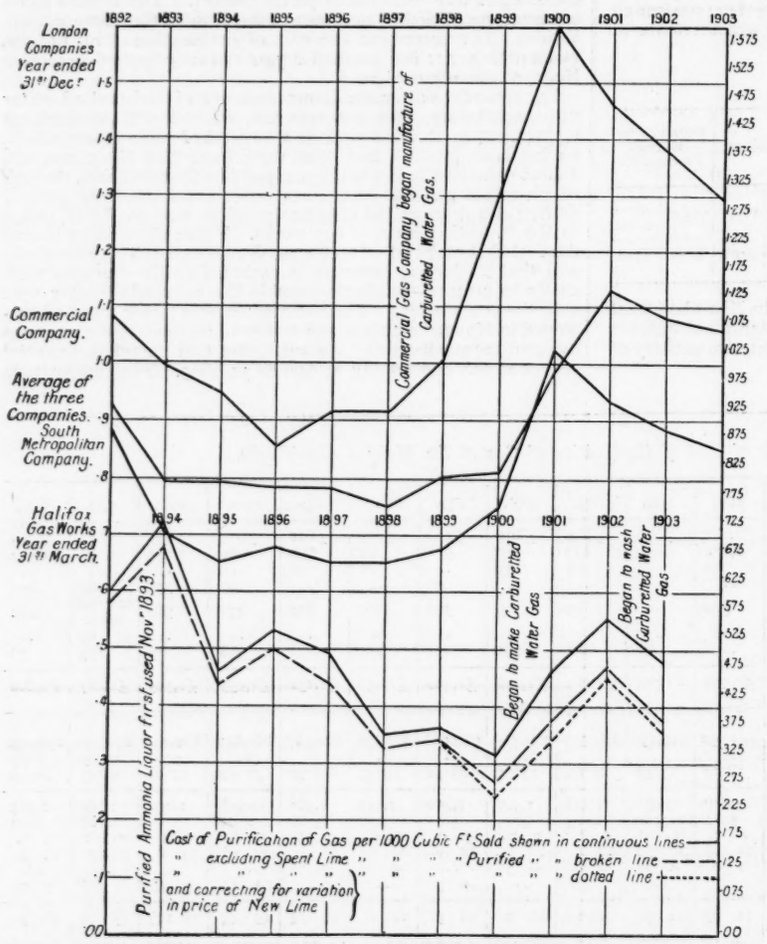
The purified liquor was brought into use in November, 1893.

The scrubber-washer employed—45 feet high, 50 feet long, and 10 feet wide, with a capacity of 13,500 cubic feet—was brought into use in 1897.

hereinafter given are between the years ended March 31, 1893 and 1894, with unpurified liquor, and year ended March 31, 1900, with purified liquor.

In estimating the saving shown by Table XIII., it is necessary to bring into reckoning the higher cost for new lime in recent years, and the cost of the removal of spent lime which ten years ago was a source of income. There ought also to be taken into consideration the lower price for spent oxide of iron now prevailing, and also the fact that the income and expenditure on oxide of iron for any one year is not so clearly defined as is that of lime; the former overlapping, according to the time of saturation of the spent oxide ready for sale. The saving in the oxide of iron and brimstone section will, therefore, be taken to be as follows: $\frac{0{\cdot}057\text{d.} + 0{\cdot}208\text{d.}}{2} = 0{\cdot}1325\text{d.}$ average cost 1893 and 1894, against a gain of 0·025d. in the year ended March 31, 1900 = a total difference of 0·1575d. × 862,842,000 cubic feet of gas purified = £566 4s. 9d.

The saving in the lime section is as follows: 5·61 lbs. of lime − 2·92 = 2·69 lbs. of lime per 1000 cubic feet of gas purified. The cost of this lime, including labour and cost of spent lime removal, was 20s. 4¾d. per ton.


1892
1893
1894
1895
1896
1897
1898
1899
1900
1901
1902
1903
London Companies Year ended 31st Dec.r
Commercial Company.
Average of the three Companies.
South Metropolitan Company.
Halifax Gas Works Year ended 31st March.
Commercial Gas Company began manufacture of Carburetted Water Gas.
Began to make Carburetted Water Gas
Began to wash Carburetted Water Gas
Purified Ammonia Liquor first used Nov.r 1893.
Cost of Purification of Gas per 1000 Cubic Ft Sold shown in continuous lines——
" excluding Spent Lime " " " " Purified " " broken line — — —
" " " " " " " " " " dotted line .....
and correcting for variation in price of New Lime

$\frac{2{\cdot}69 \text{ lbs.} \times 244{\cdot}75\text{d.}}{2240 \text{ lbs.}} = 0{\cdot}294\text{d.}$; and 0·294d. × 862,842,000 = £1056 19s. 7d.

∴ Lime and oxide sections = 0·4515d. per 1000 cubic feet purified.

If these calculations are legitimate and correct, the actual net cost for the year ended March 31, 1900, would have been raised from £1055 to £2678 if purified liquor had not been employed. The saving thus estimated being $\frac{£1623}{£2678} \times 100 = 60{\cdot}6$ per cent.

If the extra cost of lime be not taken into account, the saving of 0·4515d. becomes $\frac{0{\cdot}584 + 0{\cdot}685}{2} = 0{\cdot}6345 - 0{\cdot}272 = 0{\cdot}3625\text{d.}$ per 1000 cubic feet purified; and, again, if no account be taken of the difference of cost in dealing with spent lime, the saving becomes $\frac{0{\cdot}558 + 0{\cdot}657}{2} = 0{\cdot}6075 - 0{\cdot}294 = 0{\cdot}3135\text{d.}$ per 1000 cubic feet purified, or £1303 and £1127 a year respectively.

The first estimate of saving (£1623 per annum = 60·6 per cent.) is in accord with the analyses of the gas. Taking the abstraction of impurities by the unpurified liquor to be 18 per cent., and by the purified liquor at 67 per cent., there is left for the purifiers 82 and 33 per cent. respectively, or a saving of $\frac{82 - 33}{82} \times 100 =$ 60 per cent. It has already been mentioned that the high percentage of carbonic acid in the crude gas explains this last figure, which with normal crude gas might reasonably be expected to be much higher. The cannel hub used was necessary for maintaining the illuminating power of the gas, and keeping down the quantity of coke for sale, as, the coke from hub being worthless, it was carted to a tip. The profitable use of such a material was compatible only with a low price, and with a cheap means of dealing with the carbonic acid generated; and the financial results of this aspect of the case will presently be shown.

But before doing this, it will be advantageous to compare the results in Table XIII. with the cost of purification in other gas-works over a similar period of time, so as to see how the yearly costs are affected by changes of price of materials and labour, and by the incidence of carburetted water gas. The Metropolitan Gas Companies are taken as the standard of comparison, because the conditions of purification, over the period in question, have been almost uniform. So far as is known to the writer, the one disturbing element in the comparison is the proportion of carburetted water gas, and the extent to which this gas has been freed from its carbonic acid. When the price of oil has been low, it is believed that some of the gas has not been denuded of its carbonic acid, but that the illuminating power has been made up by an extra consumption of oil. As to the coal gas, it has been freed from sulphuretted hydrogen and carbonic acid, and the major part of the sulphocarbons throughout the period, and by each of the Companies, and the cost of doing this—without admixture of water gas—is seen in the figures for the South Metropolitan Company, shown both in the diagram and in Table XIV. How far the relatively low cost of that Company is due to the employment of Hills's process of liquor purification (which is used at the Old Kent Road works) is

TABLE XIV.—*Comparison of Cost of Purification with London Companies.*

Year ended Dec. 31.	Gaslight and Coke Company.	Commercial Company.	South Metropolitan Company. *	Average of the Metropolitan Companies.	Halifax Corporation.	Difference between Halifax and				Kind of Liquor in Use at Halifax.
						Gaslight and Coke.	Commercial.	South Metropolitan.	Average.	
1892	0·94	1·08	0·83	0·92	0·600	0·340	0·480	0·230	0·320	Unpurified
1893	0·79	0·99	0·71	0·79	0·716	0·074	0·274	..	0·074	Do.
Average .	0·865	1·035	0·77	0·855	0·658	0·207	0·377	0·112	0·197	Do.
1894	0·83	0·94	0·65	0·79	0·461	0·369	0·479	0·189	0·329	Purified
1895	0·82	0·86	0·68	0·78	0·533	0·287	0·327	0·147	0·247	Do. (*a*)
1896	0·81	0·92	0·66	0·78	0·491	0·319	0·429	0·169	0·289	Do. (*a*)
1897	0·77	0·92	0·66	0·75	0·353	0·417	0·567	0·307	0·397	Do. (*b*)
1898	0·82	1·01	0·68	0·80	0·363	0·457	0·647	0·317	0·437	Do.
1899	0·77	1·32	0·76	0·81	0·318	0·452	1·002	0·442	0·492	Do.
1900	0·90	1·60	1·02	0·99	0·466	0·434	1·134	0·554	0·524	Do. (*c*)
1901	1·20	1·46	0·93	1·13	0·554	0·666	0·906	0·376	0·576	Do. (*c*)
1902	1·15	1·38	0·88	1·08	0·476	0·674	0·904	0·404	0·604	Do. (*c*)
1903	1·14	1·29	0·85	1·06	..	..	..	..	..	

(*a*) With a few intermissions. (*b*) New scrubber in use, cost £2905. (*c*) Water gas made.

* Note that purified liquor is in use at the Old Kent Road works.

not shown by their published accounts. Carburetted water gas was first made by the Gaslight and Coke Company in 1891, and by the Commercial Gas Company in 1897; the rise in the cost of purification by the last-named Company being coincident with increased percentages of that gas, and the subsequent decrease in cost being similarly coincident with a decrease in the percentage of carburetted water gas. The percentages of that gas used by the Commercial Company are higher than those at Halifax (see Table XIII.)

Other differences between Halifax and London, such as the lower cost of lime and the higher rate of wages at the latter, will probably have remained without much variation. Bearing in mind these various considerations, that interfere with a perfect analogy, the figures of Table XIV. show that before using purified liquor at Halifax the average of the Metropolitan Gas Companies had a cost for purification per 1000 cubic feet of gas sold 0·197d. higher than Halifax; while in the last year for which figures are available, the difference was 0·604d.—a net gain of 0·407d. The gain began in 1894; and though it was retarded in 1895 and 1896 by the use of purified liquor being for a short while suspended, the gain has steadily advanced, as shown in the last column of figures in Table XIV. The difference of 0·407d. per 1000 cubic feet is in fair agreement with the figures previously calculated in another way (see *ante*) showing a saving of £1303 to £1623 per annum. A similar difference—viz. 0·407d.—would amount to £60,000 yearly in the total of the three London Companies.

(*To be concluded.*)

THE VALUE OF RAMIE TO THE GAS INDUSTRY.

By F. R. E. Branston.

In the editorial note and article which appeared in the "Journal" of the 9th ult., under the heading of "Industrial Value of Ramie," you seem only to refer to the bright side of ramie fibre; and, as usual when this subject is referred to, while blame is cast on the enterprise of our manufacturers for want of activity in their efforts to avail themselves of the advantages which are offered by it, the Teuton is again paraded for our benefit, and this fibre is represented as 'knocking at our door." From what I know of the subject, this appears to have been the case for the last century; but it may truly be said that our manufacturers have expended large sums of money on it, which have been lost for want of proper technical knowledge, and of which our professors seem to have been equally ignorant.

Ramie comes on to the market here in various crude forms, and is sold at about £15 per ton, and in the state of China grass at about £28 per ton. The latter, having been partially treated before shipment, is found to be the more serviceable of the two, even at that price. From this, some idea may be formed of the difficulty encountered before it is even partially fit for the use of the manufacturer, as the substance above mentioned constitutes about one-third of the weight on which the freight is paid on China grass, and after treatment (before it is rendered, say, equal to raw cotton) the cost is augmented to about £40 per ton.

The total imports of China grass to Europe at the present time, I believe, amount to about 3000 tons per annum, but recently I was informed by the agent for the Russian Government at Peking that this constituted a very small portion of the total production of China. So it would appear that ample supplies can be obtained. At present, there are not many mills running for the treatment and working of this fibre on the Continent. The chief seat of the industry is France and Spain.

The principal interest in ramie fibre, however, to the gas industry, centres in its value for use for the manufacture of mantles for incandescent gas lighting; and this largely depends on the treatment it receives before it is made up, as after the removal of the cutose and pectose and other material which surrounds the fibre, any injury to the cellulose which remains would interfere with the properties that make it so eminently suitable for the purpose. Some of the China grass ribbons that I have treated were found to be 6 feet in length; but I believe this was an extraordinary sample. It has a high resisting power when submitted to the influence of moisture and variations of atmospheric conditions; water does not injure it, but rather increases its tenacity; it is a powerful absorbent; it expands and contracts very little when wet or dry; and the structure is homogeneous and smooth. These qualities, caused by the peculiar formation of the cellular tissues, cause the solution of cerium and thorium to be absorbed in an even manner; and on the mantles being burnt off, carbon is formed evenly with the oxides, which results in the lasting nature of the mantles made with this fibre when used in conjunction with suitable burners. Just now French experts are working on these mantles; and I have lately received from them some of very superior manufacture, sent to me for trial, together with photometrical tests made by M. Th. Vautier, of Lyons, which show wonderfully good results. It seems therefore to France we may look for the incandescent gas light of the future.

The Eastern Counties Gas Managers' Association meet at Boston on Thursday, the 22nd inst., under the presidency of Mr. J. S. Dougall.

PERSONAL.

Mr. A. M. Cobban, late Inspector of Nuisances and Surveyor, has been appointed Resident Engineer of the Scunthorpe Water-Works, at a salary of £300 per annum.

Mr. Ernest Phillips, son of Mr. A. F. Phillips, the Engineer and Secretary of the St. Albans Gas Company, has been presented by the employees of the Company with a solid silver salver, bearing a suitable inscription, as a wedding gift.

Mr. Ferneyhough Leak, the Assistant Borough Accountant of Longton, has been selected, out of 65 candidates, for the position of Chief Clerk at the gas-works, in succession to Mr. Joseph Speakman, dismissed for reasons which will be in the recollection of our readers.

A Calcutta paper received last week notices the presentation, on the 6th ult., of a farewell gift to Mr. D. Coates Niven, on his quitting the position he held as Engineer and Manager of the Oriental Gas Company's works, after some 21 years' occupancy of it. The testimonial consisted of an illuminated and framed address—expressive of the best wishes of the Company's employees in every department for the future happiness and welfare of Mr. Niven—and a gold watch and chain. The presentation was made by Mr. James C. Watson, the present Engineer and Manager, who referred in eulogistic terms to Mr. Niven's long connection with the Company, and to his many acts of generosity to the staff and workmen, as well as in outside cases of distress, to which he ever lent a willing ear. Severances, he remarked, were always painful; but he felt sure Mr. Niven's thoughts and sympathies would ever revert to Calcutta when he got back to the Old Country. The best years of his life had been spent in India; and none of them would begrudge the well-earned years of repose to which Mr. Niven was looking forward. The presentation, Mr. Watson explained, had been somewhat delayed, consequent on Mr. Niven's severe illness; but now that they were some of them meeting him perhaps for the last time, they heartily wished him long life and prosperity, and that their gifts might often remind him of his long sojourn in Calcutta. Mr. Niven, in acknowledging the gifts and the kind words by which they were accompanied, said he would not soon forget the expressions of goodwill to which he had just listened. The Directors of the Company recently gave him a handsome inkstand and a cheque—both of which he valued as tokens of their esteem. Now the gifts from the Company's staff and employees seemed to make everything complete, by assuring him that he was still in their affectionate regard. He was very pleased that Mr. Watson had succeeded to the position he (Mr. Niven) had vacated; and he knew no one better fitted to carry on the best traditions of the Oriental Gas Company, or more capable of doing so. The real interests of the Company were safe in his hands, and he trusted he would be loyally supported by the whole staff. He could only repeat that when he left India, as he soon would do, he would carry away with him the presents they had so generously given him, and would always value them and the spirit in which they had been offered.

Monazite Sand.—In his report for last year, H.M. Consul at Bahia states that the trade in monazite sand remains in the hands of one firm; and that the whole of the 1600 tons shipped during the year came entirely from the State of Bahia. The Federal Government has recently granted concessions for exploration and work in the State of Espirito Santo; and these may, if they prove to be as successful as anticipated, cause future prices to fall. The sand in Espirito Santo is more mixed with extraneous matter than is the case with that found in Bahia; and consequently the treatment of the former is more costly.

The Manchester District Institution of Gas Engineers will hold their 139th quarterly meeting at Bradford next Saturday, under the presidency of Mr. Henry Townsend, of Wakefield. The business meeting will be held, and lunch will be served, at the Midland Hotel; and tea will be partaken of in the Cartwright Hall, in the Exhibition grounds. Beyond the purely formal business, a letter will be read from Mr. J. W. Helps with reference to the International Exhibition at Earl's Court, and the attention of the members will be directed to Keith's system of instantaneous lighting and extinguishing lamps, a demonstration of which will be given at the Exhibition during the afternoon.

New Coal-Handling Plant at Beckton.—Messrs. Graham, Morton, and Co., Limited, have just erected, on contract, a complete coal-handling plant in connection with the new retort-charging machines at Beckton. It consists of a receiving hopper, jigging feeder, and two-roll crusher, a cased-in elevator, with receiving hopper and delivery shoot, and one large coal storage bunker, together with all the structure for supporting the whole plant, all necessary gearing, and the electric motor. The coal is tipped out of the waggons into the receiving hopper, where it is jigged into the crusher. The jigging shoot is arranged so that the small coal is bye-passed direct into the elevator boot; the large coal being passed on to the crusher, from which it falls into the same receptacle. Thence it is elevated into the bunkers placed over the charging-stage of the retort-house. The bunker is provided with a slide and levers, so that the charging machines can be filled at will.

THE UTILIZATION OF GAS COKE.

A paper on the above subject was read before the Hanover meeting of the German Society of Gas and Water Engineers by Herr E. Stack, of Hanover, and was printed in the "Journal für Gasbeleuchtung" on the 13th ult.

Approaching the matter from the hygienic standpoint—*i.e.*, with the aim of diminishing the quantity of smoke produced from coal furnaces and fires in large towns, the author has endeavoured to study the technical and financial value of gas coke as a fuel in comparison with various grades of coal, oven coke, briquettes, and the like. He divides the furnaces in which coke may be consumed into three classes: (*a*) The furnaces of steam-boilers; (*b*) trade fires, such as bakers' ovens, smiths' fires, brewers' pans, &c.; and (*c*) domestic fires, kitcheners, laundry apparatus, and warming plant for large institutions. In order to obtain representative opinions as to the value of coke for the different purposes in view, the author addressed a series of questions to users and makers of various plant, to owners and inspectors of steam-boilers, and to municipal and other heating engineers; the replies received forming the material for his article, of which we give the following abstract account.

Steam Raising.

Except in the case of municipal electricity and water works, where the engineers are frequently compelled to burn the coke made in the gas-works which belong to the same authority, coke is but seldom used for steam raising; the possibility of so employing it being ignored or doubted. In the new gas-works at Vienna, ten Lancashire and three water-tube boilers have been running satisfactorily on coke for the past five years; and in Hamburg there are eighteen tubular boilers in the Government buildings similarly fired with coke. Experiments have also been tried in the high-pressure boilers belonging to a Municipal Hospital at Hanover, and in two Dürr boilers in the Courts of Justice at Munich. The results of these and other tests with gas coke, coal, &c., in high and low pressure boilers are given by the author in the form of a table, which shows that coke varies so much in its composition, and especially in the proportion of ash it contains, that lessons of general applicability cannot be learnt from the figures submitted.

Broadly speaking, coke firing is more difficult to manage than any other, and does not lend itself to irregular or sudden demands for steam. The furnaces and the draught must always be so arranged as to suit coke, if that fuel is to be employed. In the hospital at Hanover, the bars clinkered in two hours when small coke was burnt, in 6 hours with large coke, and in 16 hours with (Oberkirchen) coal. At Munich, where the steam pressure was kept at from 8·3 to 8·8 atmospheres, the evaporation was from 7·01 to 8·35 lbs. of water per pound of coke; while the efficiency ranged from 64·76 to 74·25, and the amount of ash in the fuel varied (but not in accordance with either the evaporation or the efficiency) from 5 to 10·47 per cent. Certain boilers with forced draught were tested among the others. Manifestly, the economic value of gas coke as a steam-raising fuel depends on the local conditions which govern its price and that of other fuels; and it therefore varies greatly. The technical value of coke varies just as much, depending principally on its ash.

Trade Furnaces.

Bakers' Ovens.—The old form of oven in which the loaves are placed in the same chamber as the fire is not suitable for coke as a rule, partly because the draught is not powerful enough, and partly because, when fed with coke, the oven becomes too hot in front and not sufficiently heated at the back to give good results. The re-arrangement of such ovens to suit coke is a costly operation, and is not likely to be undertaken often—more particularly because coke firing is generally more expensive than coal or briquettes, though cheaper than wood. In the newer forms of bakers' oven, which are externally heated by means of steam, coke works admirably as the original fuel, provided the furnace is suitable and the draught strong enough. These externally-heated ovens are favoured by municipal officials and by most large bakers, as they keep the bread cleaner. Moreover, bakers' ovens constructed to burn coke will work with a coal or wood fuel should the necessity arise. They are being introduced rapidly in Germany; and in some towns there is a regulation that all new ovens must be constructed according to this system, and that coke must be the fuel employed. There is a large bakery at Breslau which has been running for two years with steam-heated ovens; the immediate fuel being a semi-water gas made from coke in a König producer. It has proved quite satisfactory, and an addition to the plant is now being made which will turn out 30,000 loaves per diem from a consumption of about 20 tons of coke. Coke is also used exclusively in the military bake-house at Mainz.

Engineers' Furnaces.—Broken, but not small, coke makes an excellent fire for forging and welding, giving a perfectly clean heat. It is employed in a good many shops for this purpose, and a considerable number of boiler makers use it as well. The only defect is the clinker, which makes it necessary to employ oven coke for extra heavy work. Naturally, in the manufacture of iron articles that have to be put back into the fire repeatedly, the impurities in the coke may affect the nature of the finished metal.

Sundry Trade Fires.—Laundries are now generally run by steam power, so that the use of coke in such places comes within the first category mentioned. In Magdeburg, gas coke is largely used for roasting chicory. It is also employed in the production of a fuel gas for suction motors. In Stuttgart, there are 14 coke-fired motors used in connection with the municipal latrines. In Hanover, unsuccessful experiments have been tried upon the use of coke for heating brewers' coppers; but it is believed that had the furnaces been differently arranged and the draught more powerful, the coke would have given satisfactory results. Enamelling, drying, and annealing ovens are already mostly fired with coke, or can be so built that coke may be used if necessary.

Domestic and Institution Heating.

The author devotes much attention to the possibility of burning coke in the closed domestic stove popular in Germany. At least one firm constructs a stove intended for coke alone; but, generally speaking, a mixture of coke and coal is better, because of the unskilled labour which superintends such apparatus. Gas coke has hitherto been most widely adopted for the warming of large buildings and institutions by means of high and low pressure steam, hot air, and hot water installations. For this purpose, it is peculiarly suitable, as it gives fires which last for some time without requiring attention. Before last winter the Town Hall at Bremen was heated with oven coke, and when gas coke was tried, the consumption was found to be twice as great; but as the price of the new fuel was half that of the former, the cost remained the same, and the result was good. In Mainz, the City Theatre consumed 5 metric tons of gas coke more during the season 1900-01, when the average temperature was 2·65° C., than the quantity of oven coke consumed in 1901-02, when the temperature of the air was 4·21° C. But the cost of the gas coke was less; and it is now always employed.

During the winter of 1902-03, some experiments were carried out at Charlottenburg in a school fitted with a hot-water warming apparatus. When Upper Silesian coal was used, the efficiency of the plant came out at 54·7 per cent.; and when a mixture of two parts of coal and one part of gas coke was tried, the efficiency was 47·2 per cent. These figures are low, as the grate area was too small. In another school provided with a low-pressure steam apparatus, gas coke gave an efficiency of 78·9 per cent., and in a third school having a hot-water apparatus coke gave 59·5 per cent. The steam plant gave the best results because that type of heating is most suited to the varying demands of school premises. In the following winter, similar tests were carried out with gas coke in three Charlottenburg schools having hot-water warming apparatus, when the efficiency ranged from 48·5 to 62·5 per cent.; while in a hospital provided with a high-pressure steam apparatus, a mixture of two-thirds coal and one-third gas coke gave a mean efficiency of 70 per cent. Some of the plants tested were constructed of cast iron, which apparently did not suffer. In one of the official buildings at Hanover, which has a low-pressure steam heating plant, six experiments with gas coke gave a mean efficiency of 69·76 per cent., the mean evaporation being 7·35 lbs. of water per pound. Three tests with oven coke gave 72·34 per cent. efficiency, and an evaporation of 8·41 lbs.

Conclusions.

Herr Stack concludes his paper with a lengthy table containing analyses and determinations of the calorific value and evaporating power of numerous samples of coal, gas coke, and oven coke. The highest calorific value for gas coke found was 7455 calories per kilo.; the lowest 5480. In 14 days the Munich coke made from the same coal varied from 6841 to 7440 calories The oven coke always showed a lower calorific value than the gas coke, though it is esteemed a better fuel; and it was noticeable that the poorest specimens of oven coke came from a place whose product is found in practice to be good. The difference between the highest and the lowest figure for the percentage of ash in oven coke was only 7·5; the corresponding difference in the case of gas coke was 15—*i.e.*, 2 more than was found in the coals examined. The largest amount of ash in the oven coke was 11·5 per cent.; that in the gas coke, 18·3 per cent.

The great irregularity in the composition of gas coke, the high proportion of ash it contains, and the large amount of clinker (often of a very objectionable character) which it leaves are the main causes why coke is not more generally used as a fuel to-day. In the author's opinion, far too little attention is bestowed by gas makers upon the quality of their coke; the material is comparatively seldom analyzed or tested for calorific value; and no attempts are made to improve it. If, possibly by washing the coal before carbonization, the coke produced on gas-works were to have its present defects minimized or removed, it would not have to be sold at any price to get rid of it, but would prove a most valuable fuel by reason of its cleanliness, and by virtue of the improvement which its more general consumption in domestic hearths would effect upon the atmosphere of cities and towns.

M. Lelianoff, the Mayor of St. Petersburg, has been visiting London; and, of course, has been interviewed by one of the municipal newspapers. In the course of this interview, he stated that the St. Petersburg Duma own the water supply and the tramways, and will acquire the gas undertakings at the expiration of another five years, when the concessions end. The electric light works are owned by Russian and foreign companies.

UTILIZING THE WASTE HEAT OF GAS-ENGINES.

At the Summer Meeting of the Institution of Heating and Ventilating Engineers, held in Liverpool a short time since, a paper on the above subject was read by Mr. GEORGE CHASSER, of Stourbridge, who gained by it the first prize in the assistants' competition last year. The paper was briefly noticed in the "JOURNAL" for July 26. The following is an abstract of it.

The author began by saying that the many useful purposes to which the exhaust heat from steam-engines had been applied demonstrated what might be done in the utilization of the waste products from other forms of motive power. It was his purpose to show in the paper that this rule might be applied to gas or internal-combustion engines where the heat that usually passes through the exhaust-pipe to the atmosphere, and also the water heated in the cylinder jacket, represent a considerable amount of waste energy that could be usefully applied. The increasing use of gas-engines made it important that, where possible, the waste should be utilized, though little had been done in this direction. To determine what heat was available from any engine, it was necessary to know what became of the calorific power of the gas admitted to the engine, how much was absorbed in power, and how much went to waste.

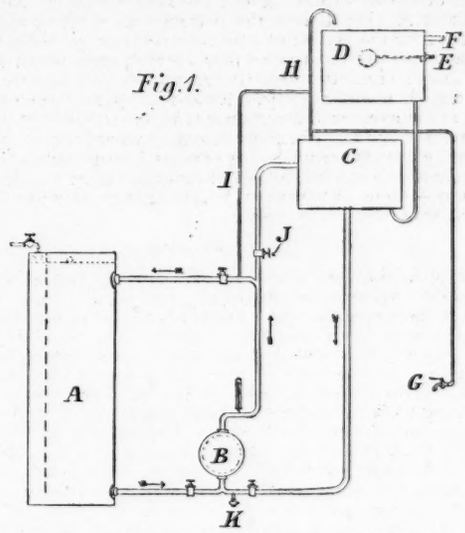
For the purpose of investigating the heat losses and the approximate amount of heat available, a 50 brake horse power engine was taken. From a number of tests carried out to determine the efficiency of gas-engines, it appears that only from 18 to 25 per cent. of the calorific power of the gas admitted to the engine is used up in mechanical energy or power; the remainder going to waste in the exhaust gases to the atmosphere, in the cylinder jacket water, and to heat up the metal of the engine, ignition-tube supply, &c. If these processes are examined separately, it can be determined approximately what is the calorific value of the waste gases. From 18 to 22 cubic feet (according to the efficiency of the engine) of ordinary illuminating town gas per brake horse power per hour is the quantity consumed, judging from the results of a number of tests by various authorities. Taking the calorific power of town gas to be 630 British thermal units per cubic foot, this gives a total of 630 units by 18 cubic feet, or equal to 11,340 B.T.U. in the gas admitted to the engine per brake horse power per hour. A brake horse-power-hour of work requires the consumption of 2580 B.T.U.; and this quantity taken from the total of 11,340 units leaves 8760 units, or 77 per cent. of the total calorific power of the gas. This represents the waste heat per brake horse per hour; about 55 per cent. of the total 11,340 units being available for useful purposes.

Taking as an illustration a gas-engine that would give 50 brake horse power when working at full load, each horse power consuming 18 cubic feet per hour, determined by the gas-meter, then 50 × 18 = 900 cubic feet × 630 units = 567,000 B.T.U. as representing the total calorific value of the gas admitted to the engine. Of this quantity, only 129,000 units, or about 23 per cent., is absorbed in mechanical energy or work performed by the engine in driving shafting. It is found in practice that from 30 to 40 per cent. of the total calorific power of the gas admitted to the engine is absorbed by the jacket water. Consequently, for the 50-horse power engine, 170,100 B.T.U. per hour are absorbed in this way. Mr. Chasser drew up the following heat account for the engine:—

	B.T.U. per Hour.		B.T.U. per Hour.
Heat in the gas admitted to the engine per hour: 50 B.H.P. × 18 cubic feet per B H.P. = 900 cubic feet × 630 B.T.U. calorific power per cubic foot equal to	567,000	Heat expended in power, about 23 per cent. . .	129,000
		Heat absorbed by jacket water, 30 per cent. . .	170,100
		Heat absorbed by the heater from exhaust gases, 25 per cent. . .	141,750
		Heat radiating from the metal of the engine, gas ignition, and unaccounted for through exhaust, about 22 per cent.	126,150
Total	567,000	Total	567,000

The quantity of heat assumed for power—23 per cent.—probably represents the maximum.

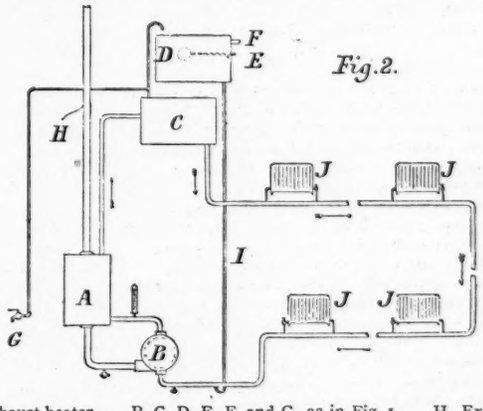
Having arrived at the amount of heat available from the engine, Mr. Chasser proceeded to consider how it could be applied; and he showed, by the arrangement illustrated in fig. 1, how it might be utilized, without any combination with the exhaust heater, for heating a quantity of water in a tank for draw-off purposes. From the heat account, it is seen that 30 per cent., or 170,100 B.T.U., are available per hour. About 160° Fahr. as a maximum is the desired temperature of the cylinder jacket water, which therefore would be the highest temperature that should leave the jacket in the flow main to the tank. A permanent thermometer should be fixed in the jacket as a guide. Suppose the system was full of water at 40°, then 160—40 gives an increase of 120° to be raised. One B.T.U. will raise 1 lb. of water 1° Fahr.; then 170,100 ÷ 120 = 1417 lbs., or 141 gallons raised from 40° to 160° in one hour, 282 gallons in two hours, or 423 gallons in three hours, *minus* loss from radiation. Any other temperatures below 160° are obtained in the same way—say, 50° to 100° = 50° increase; then 170,100 ÷ 50 = 3400 lbs., or 340 gallons raised from 50° to 100° Fahr. in one hour. The flow and return mains and the tank should be coated with non-conducting material, to prevent loss by radiation. In this arrangement, if the hot water is not required continually, it will be necessary to open the draw-off tap to allow of sufficient water going away which will keep the flow temperature below 160°. To raise the water above this, it will be necessary to connect the flow-pipe from the cylinder jacket to the heater or boiler through which the exhaust gases are taken; the return pipe from the tank being continued for heating purposes, and radiators taken off so as to reduce the return temperature to about 140° where it enters the cylinder jacket, as



A. Ordinary cylindrical cooling-tank. B. Engine cylinder. C. Hot-water tank. D. Cold-water cistern, having supply and overflow pipes E, F. G. Hot-water draw-off tap. H. Expansion-pipe. I. Safety-pipe. J. Valve. K. Emptying tap.

shown in fig. 2. If the heat available from the exhaust gases is sufficient to give the required quantity and temperature, then an exhaust heater working separately from the jacket water heat would be the best arrangement; the jacket water heat being used, if required, for a radiating system. When a new engine is put down, and use can constantly be found for the jacket hot water, it will not be necessary to provide the ordinary cylindrical cooling-tank shown in fig. 1.

Taking the exhaust heat, and referring to the heat account, it will be seen that the available heat is 141,750 units; and supposing it is wished to heat up a quantity of water to 200° Fahr., Mr. Chasser now shows how it can be applied. From the particulars of a test to be noticed later (1⅓ square feet of heating surface in



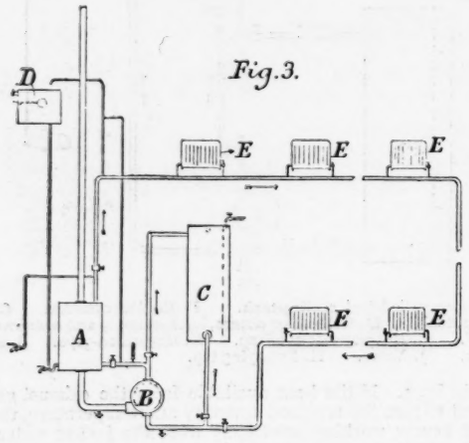
A. Exhaust heater. B, C, D, E, F, and G, as in Fig. 1. H. Exhaust-pipe. I. Cold-water feed-pipe. J. Radiators.

the heater per brake horse power was the basis), it was found that more surface would have given better results. He therefore took a basis 1½ square feet, giving 75 square feet in the heater. This surface should absorb the 141,750 units. The portion of the gases going to waste to the atmosphere is represented in the bulk of the unaccounted-for portion shown in the heat account. Supposing the initial temperature of the water is 40° Fahr., then 200—40 gives an increase of 160 to be raised; 141,750 ÷ 160 = 886lbs., or about 88 gallons raised from 40° to 200° in one hour with mains and heater coated. Any good design of wrought or cast iron heater can be used which is sufficiently strong for the purpose; but care must be exercised not to put any unnecessary back-pressure on the engine. A cast-iron baffle-

plate should be fixed near the inlet inside the heater, to receive the impact of the gases.

The author next considered what can be done with a combination of the jacket water and exhaust gas heat from the 50-horse power engine in a radiating system. From the heat account it is seen that the heat is 170,100 units from the jacket water and 141,750 units from the exhaust gases; making a total of 311,850 units per hour. Of this total, the jacket water represents 54 per cent. Assuming the drop in temperature of the flow and return to be 30°, this multiplied by 54 per cent., or 0·54 = 16, which, deducted from 160, the temperature of the jacket water flow, gives 144° as the return temperature entering the jacket; 30° − 16° = 14° to be added by the exhaust heater; 160° + 14° = 174° as the temperature of the flow from the exhaust heater. In the arrangement shown in fig. 3, the flow pipe from the jacket at 160° was connected near the bottom of the exhaust-heater, passed through the latter, and left the top as flow at 174°, after which it was cooled down by sufficient radiating surface so that it entered the return on the jacket at 144°. Now, 174° + 144° = 318 ÷ 2 = 159° as the average temperature of the water. With this as the average temperature of the circulating water, about 1·5 heat units were emitted per square foot of radiating surface per degree of difference between the water and the room to be heated (say) to 60°, 159 − 60 = 99 × 1·5 = 148 heat units emitted per square foot per hour.

Fig. 3.



A. Exhaust heater. B. Engine cylinder. C. Cooling-tank. D. Cold-water cistern. E. Radiators.

In the case of an ordinary radiating system heated by an efficient boiler, it gives an average temperature of the water of 170°; and it is usual to allow 1·8 heat units emitted per square foot per degree of difference, 170 − 60 = 110 × 1·8 = 198 heat units emitted per square foot per hour. This, when compared with the engine-heated surface, gave 198 ÷ 148 = 1·33, or 1⅓ times the radiating surface required for the engine heating, compared with ordinary heating with the water temperatures stated. Taking 311,850 heat units available from the cylinder jacket and exhaust gases and dividing by 148, we get 2107 square feet of surface required, inclusive of mains, with an average water temperature of 159° Fahr.; and 2107 ÷ 50 = 42 square feet of radiation per brake horse power, with heater and mains coated.

If the heat is applied in two distinct systems—one from the cylinder water jacket and the other from the exhaust heater—the results are rather better. Taking the cylinder jacket flow at 160° the return at 144, average 152 − 60 room temperature = 92 × 1·5 = 138 heat units per square foot per hour. Then 170,100 heat units ÷ 138 = 1232 square feet of radiating surface, exhaust heater flow 180°, return 160°, average 170° − 60° = 110° × 1·8 = 198 heat units per square foot per hour. Then 141,750 units ÷ 198 = 716 square feet of radiating surface. Comparing the totals, jacket water heat 1232 feet and exhaust heater 716 feet —total, 1948 square feet—with the combined arrangement, 2107, it is seen that there is required 159 square feet less radiation with the separate systems to give off the same heat. It is evident that with the two systems less heating surface is required, because the exhaust-gas heater system can be made to give water of 170° average against the 152° of the cylinder-jacket system—

With the combined system, total 2107 ÷ 50 = 42 square feet per brake horse power.
With the jacket system, total 1232 ÷ 50 = 25 square feet per brake horse power.
With the heater system, total 716 ÷ 50 = 14 square feet per brake horse power.
Total for the jacket and heater combined, 42 square feet per brake horse power.
Total for the jacket and heater separate, 39 square feet per brake horse power.

These quantities are inclusive of all mains.

The author next considered the amount of fuel saved by using the waste heat from the engine. Taking 1 lb. of coal of an average quality to contain the theoretical quantity of 12,000 B.T.U., about one-half would be transmitted to the water by an ordinary boiler. The heat units available from the engine were 311,850, which divided by 6000 equalled 52 lbs. of coal per hour. Supposing the heat was used continually throughout the year for hot-water supply purposes, and taking 300 days of ten hours, the total was 3000 hours. This figure multiplied by 52 lbs. gave nearly 70 tons of fuel, which, taken at 10s. per ton, showed £35 saved per annum. For radiating-purposes we might certainly take one-half the time in use, which gives £17 10s. per annum. For the whole of the year, this worked out to 14s. per brake horse power saved.

Mr. Chasser also referred to some tests and experiments made with a 30-horse power engine. To determine what heat could be saved from the exhaust gases as well as the jacket water, a heater was made through which to pass the gases. It was fixed very near to the engine, and took the place of the cast-iron boxes or silencers. From the top of the heater the exhaust outlet was carried above the roof, to convey what gases were left. The short length of exhaust-pipe between the engine and the heater, as well as the heater itself, was covered with non-conducting material; that on the exhaust-pipe being loose silicate cotton about 3 inches thick. To obtain the exact temperature of the exhaust gases was a difficult matter, owing to the force of explosion; but some idea of the heat could be obtained when it was known that the silicate cotton around the pipe was made red hot, while sheet lead put round the exhaust-pipe was melted directly—thus indicating a temperature of at least 620° Fahr. on the outside with the air in contact with it. Probably the exhaust gases were from 700° to 750° after leaving the engine-cylinder.

The test was made in the following manner: The engine was put to work with a full load, and for 15 minutes the amount of gas admitted to the engine was carefully taken at the meter. During this time water was drawn from the heater and the cylinder jacket; both systems being quite distinct, and each having an automatic water supply. The weight of water drawn from each, together with the respective temperatures, was taken during the test, the result of which was as follows:—

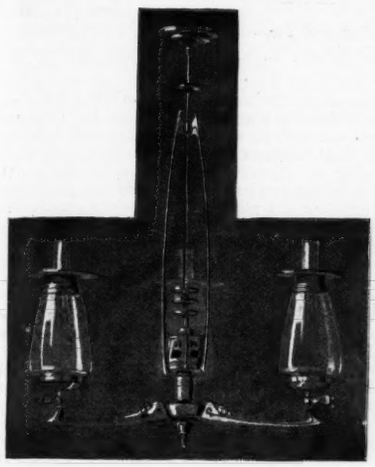
Revolutions, 180 per minute, with full load.
Town gas, 550 cubic feet per hour.
550 cubic feet ÷ 18 cubic feet per per brake horse power gives 30·5 brake horse power.
550 × 600 B.T.U. per cubic foot gives 330,000 B.T.U. as the total calorific power of the gas admitted to the engine per hour.
Cylinder jacket supplied 2100 lbs. of water per hour heated from 86° to 105° Fahr., or 40° increase.
Cylinder 2100 lbs. × 40 = 84,000 B.T.U. = 25 p. ct. of total value.
Heater 2100 ,, × 40 = ,, ,, = 25 p. ct. ,, ,,
Temperature of the exhaust gases leaving top of heater, 215° Fahr.
Heating surface of heater 40 square feet = 1⅓ square feet per brake horse power.
Heating surface recommended in the heater, 1⅓ square feet per brake horse power.
Heater and the exhaust-pipe connecting same were coated.

The author concluded by emphasizing the importance of considering what can be done with the waste heat of gas-engines, in view of the increase in the number and size of these motors; and he expressed the hope that the means of utilizing it to which he had called attention might be of some assistance to those who are dealing with the subject.

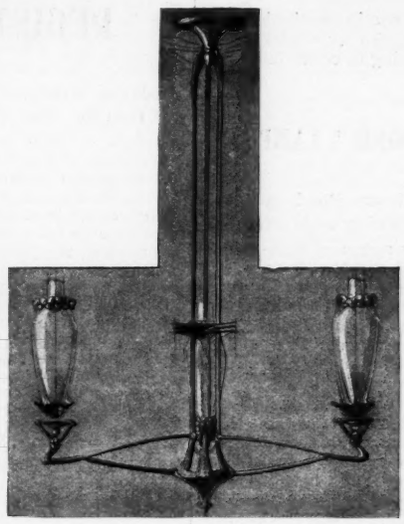
THE DESIGN OF GAS-FITTINGS.

At the beginning of 1903, the German Society of Gas and Water Engineers instituted a prize competition for the design of gas-fittings which should be at once useful and highly artistic. The designs were to be submitted in sets of three, comprising a pendant for three to six lights, a wall-bracket for one to three flames, and a table lamp; and each design had to be accompanied with full-sized working drawings, in section, &c., of the apparatus suggested. Four prizes were originally offered; one each of 1000, 700, 500, and 300 marks. The models, 126 in number, were first exhibited at the meeting of the Society which was held at Zürich last year, and they were afterwards taken round to a considerable number of the larger German towns, and placed on exhibition there also. The six judges finally decided to alter the arrangements governing the awards, finding it preferable to give two equal first prizes of 600 marks, two second prizes of 500 marks, one third of 300 marks, and 3 lower grade awards of 200 marks each.

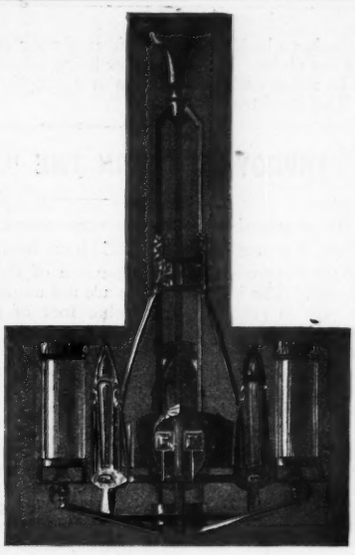
According to Professor Gmelin, the Editor of "Kunst und Handwerk," who has criticized the exhibits at some length, the best designs submitted to the judges were favourably characterized by the plainness and simplicity of their lines; the fittings that received the highest awards being such as would not have met with general approval 25 years ago. It is only recently that the fantastic and over-decorated patterns of by-gone days have given way to severity—a change which is the more welcome because of the way in which the electric light lends itself to unpretentious pendants or supports. For instance, in the two 3-light pendants that received the first prize, the tube conveying the gas was honestly divided into three pieces, each supplying a burner, or a single central tube was surrounded by three slightly bent rods to give greater breadth and rigidity; while the connections between the base of the pendants and the burners were made with simple straight or curved tubes, not loaded with showy



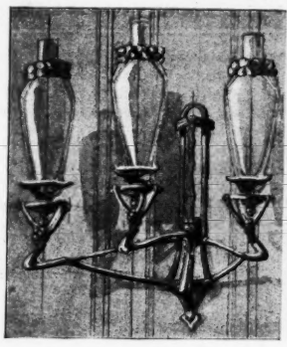
First Prize—Ortlieb, of Berlin.



First Prize—Fehse, of Berlin.



Second Prize—Franke, of Berlin.



First Prize—Fehse, of Berlin.

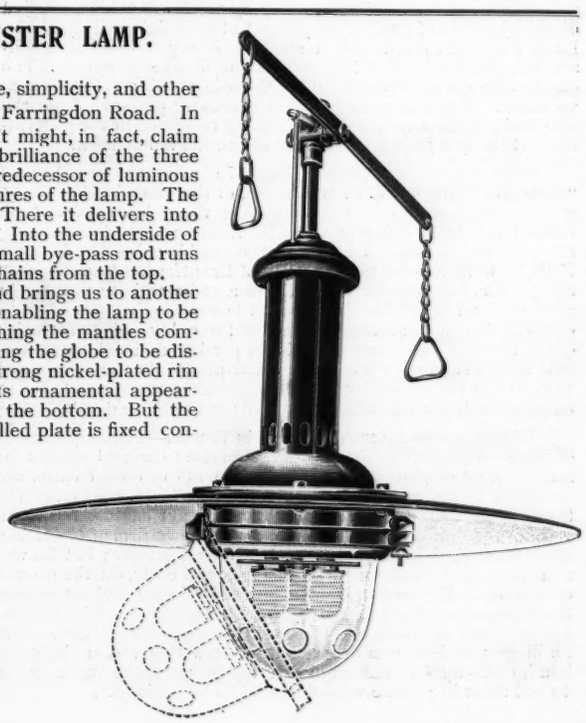
First Prize—Ortlieb, of Berlin.

leaves or scroll work. In some of the less satisfactory designs, the glassware of the burners was slung from above instead of being supported from beneath. Professor Gmelin holds this to be an artistic error. A gas-burner must be supplied with gas from beneath the flame, and the leading tube is nothing to be ashamed of. The plan of bringing the pipe down inside the globe is therefore a species of deception. When, moreover, the globe is made with no opening at its base, there is no convenient place for the necessary cock, no aperture for the admission of air to the flame, and the whole device becomes a wanton imitation of the electric glow lamp. When glow lamps were first introduced, they were always carried from underneath, because that was the custom with gaslights; but now that the advantage of a depending glow lamp is everywhere apparent, the designers of gas-fittings feel compelled to copy the idea blindly. This is not art or common-sense, for everything should be treated in the way that suits it best, and should not be forced to masquerade in borrowed attire. Professor Gmelin is obviously referring only to the burner which is itself upright; he makes no reference to the inverted arrangement.

AN INVERTED INCANDESCENT MANTLE CLUSTER LAMP.

A new lamp which will commend itself for its striking appearance, simplicity, and other good qualities is being introduced by Messrs. J. & W. B. Smith, of Farringdon Road. In external form, it looks much like the old regenerative gas-lamp. It might, in fact, claim all the good points of that lamp, with the additional one that the brilliance of the three inverted mantles used was never attained by its almost forgotten predecessor of luminous flame. The illustration shows admirably the construction and features of the lamp. The gas-supply pipe, it is seen, is carried centrally down the chimney. There it delivers into a chamber situated just above the air-inlets to the bunsen tubes. Into the underside of the chamber are screwed the three long plain bunsen tubes. A small bye-pass rod runs down inside the chimney; and the lamp is lighted by a lever and chains from the top.

This completes the description of the upper part of the lamp, and brings us to another feature, which contributes certain important advantages—such as enabling the lamp to be opened for cleaning without any trouble, also removing in the opening the mantles completely away from the burners (thus obviating damage), and allowing the globe to be disengaged for cleaning with equal facility. This part consists of a strong nickel-plated rim hinged on to the under-side of the lamp, and adding greatly to its ornamental appearance. The rim carries the globe, provided with air-supply inlets at the bottom. But the interesting feature is that, inside the globe-support, a white-enamelled plate is fixed containing three holes from which the inverted mantles depend, and into which the bunsen tubes project. It will thus be seen that, when the rim is unfastened, the globe and mantles are carried right away from the burners, and the latter need not be interfered with in any way. The mantles are fitted with steatite supporting rings, in the usual manner, with three hooks for suspension. Plenty of ventilation is afforded in the lamp, as well as of reflecting surface. Besides the mantle-suspension plate being made of white enamel, there is (as seen) a large reflecting-hood above.



The lamp has not yet been photometrically tested; but its consumption of gas, at 15-10ths pressure, is about 10 cubic feet per hour. There is no doubt about the lighting power being high, the effect is certainly good, and there is a complete absence of shadow. The lamp illustrated is the one intended for interior use; and it

is only 19 inches in length from the top connection to the bottom of the globe. A form is now being constructed for outdoor use. The name under which this new lamp is going to court favour is "The Brightray."

IMPROVEMENTS IN THE "POND" LAMPS.

In preparation for the coming season, Messrs. Pond and Co., of 62, Farringdon Street, E.C., have been turning their attention to the improvement and extension of their range of high-power lamps. The improvements are not so much directed to securing a gain in efficiency per cubic foot of gas consumed (that was already high), but in the general construction of the lamps, and in making them adaptable to all situations, circumstances, and requirements in and for which such lamps can be used. The "Wis," the "Pond," and the "Galeproof" were the original lamps with which the firm started business, and introduced themselves to the gas industry as the makers of lamps on practical lines. The "Wis" lamp, which is of the type with elongated chimney for the purpose of securing a forced draught, and an intense illuminating power, is now being made for indoor use in two sizes—400 and 700 candle power. In both cases, a duplex burner is used, provided with a regulating air shutter and gas nipple, so that the lamps can be adjusted to suit the quality of the gas supply in any district. The old form of curved supply pipe has been discarded for a straight central one. The outside form of the same lamp has also been improved in various ways. The large single burner and mantle has been displaced by the duplex form of burner; the makers having found from their extended experience, that this will be more economical for the users in respect of the wear and tear on the mantles than the single larger burner, without in any way affecting the efficiency of the lamp. This outdoor lamp is also constructed in two sizes—400 and 700 candle power. The reflector is now made of octagon form, with gilt ornamental border; and this has greatly relieved the rather heavy appearance which the old dome-shaped type seemed to give to the lamp. Both forms of the lamp are now constructed entirely of copper; and every part is made in this country. The "Pond" patent "arc" lamp has been similarly improved; and it has further been rearranged so that the cock is inside the body of the lamp, and operated by lever and chains. The cock is so devised that, when the lever is in a horizontal position, both burners are lighted up; by pulling the chain so as to make the cock turn the full length of its travel, one burner is extinguished, and the other is left alight. Pulling the chain down to its fullest extent on the other side extinguishes both burners. All the lamps look extremely well as the outcome of the changes recently made. The firm's new catalogue, it may be mentioned, illustrates some exquisite designs in the way of gas-fittings.

Gas-Engines for Generating Electricity.—An illustrated article in the "Electrical Review," describing the new electricity works at Leek, states that the generating plant in the engine-room consists at present of two "Stockport" horizontal single-cylinder gas-engines, each capable of developing 100-horse power, coupled direct by means of flexible couplings to two 60-kilowatt dynamos. Each engine is fitted with a specially heavy fly-weel and self-starter; and the ignition is electrical, and fitted in duplicate. The engines are governed both by the throttle and by a hit-and-miss governor. The gas is supplied, at gasholder pressure, from the gas-works of the District Council; being regulated at the generating station by a special governor fixed in the motor-room.

Radio-Activity of Natural Gas.—In a recent number of "Nature," Professor T. C. M'Lennan, of the Ontario University, gave particulars of some experiments on the radio-activity of the natural gas from different wells in Western Ontario, including those in the Welland district, in the neighbourhood of Niagara Falls, as well as those near the city of Brantford. In every case the gas was found to be charged with a radio-activity varying in amount; and in all the gases tested the strength diminished to one-half its original intensity in about three days. The intensity of the induced radio-activity which it produced died down to one-half value in about 40 minutes. The depths of the wells examined varied; but the amount of active emanation present was found to be practically the same in all the wells at the same depth.

Litigation over Inverted Burners in France.—The employment of inverted burners in France has given rise to several actions for infringement of patents; and the judgments in recent cases are recorded in the current issue of "Le Gaz." M. Farkas, of the Société du Bec Renversé, brought an action against the Compagnie Générale d'Appareillage (the well-known firm of Delafollie, Bastide, et Cie.) in respect of their inverted burner; but he was nonsuited, and condemned in damages and costs, on the ground of priority. He was equally unsuccessful in his actions against the Compagnie Paris Lumière and the Société La Washington. His seizures of the goods of these Companies were decided to be illegal; and he was ordered to restore them. On the other hand, three foreign makers of inverted burners who endeavoured to sell them in France were declared to be infringers.

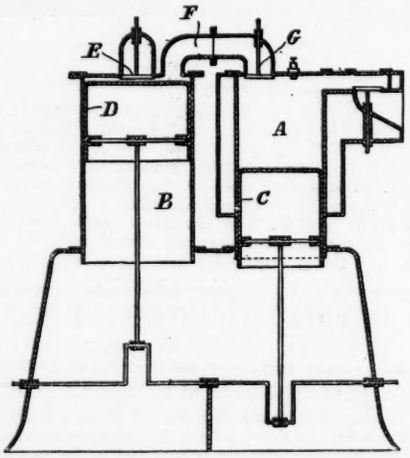
REGISTER OF PATENTS.

Producing Mixtures of Gas and Air.—Lake, H. H.; a communication from the Selas Gesellschaft, m. b. H., of Berlin. No. 17,788; Aug. 17, 1903.

This is another of the series of "Selas Process" patents; the claim for the present invention being for a regulating device for "the production of mixtures of gas and air with separate suction of gas and air, characterized by the fact that between the suction and forcing chambers an adjustable member is interposed which is submitted to the influence of the pressure in the service-main in such a manner that, when alterations of the pressure take place, the connection between the suction and forcing chambers is produced or altered." This end is attained by the provision of back-suction conduits and by means of a regulating device constantly altering the cross-section of the passage of these conduits, so that a greater or less part of the quantity of gas and air sucked in at each operation of the suction apparatus is replaced by back-suction of the previously forced gas and air mixture, or by gas and air out of the suction-chamber, which, for the time being, is inoperative. Contrary to what is the case with the circulation devices hitherto used for this purpose, the suction-conduits are never obturated, but the suction-valves are "invariably and uniformly" opened and closed at each operation of the interruptedly working pump. An important feature of the arrangement is the avoidance of the use of non-return valves and the employment of positively operated valves.

Increasing the Output of a Four-Cycle Internal Combustion Engine.—Lindemann, O.; a communication from W. Kuhl, of Linden, near Hanover. No. 18,130; Aug. 21, 1903.

Four-cycle internal combustion engines as hitherto constructed can, under the most favourable circumstances, the patentee remarks, take in a combustible charge corresponding with the effective volume of the working cylinder at the end of the working stroke, and which determines the maximum output of the engine, "provided it has the best quality and is a completely burning mixture." If it were possible to introduce a greater charge into the cylinder, more power could, of course, be obtained from the engine. According to his present proposal, the charge in a four-cycle internal combustion engine is increased by pressing the mixture into the working cylinder by a separate charging pump having a cylinder of greater effective volume than that of the working cylinder. Instead of sucking the mixture in by the working piston, the introduction may be effected during the suction stroke of the working piston.



In the machine shown, as working according to the invention, the working cylinder A is that of an ordinary four-cycle engine; and the cylinder B is a charging pump. The pistons C and D of these cylinders are respectively connected with a double-cranked shaft, having its cranks at an angle of 180° to each other. The pump piston D on its outward stroke sucks in combustible mixture through the valve E; and on its return stroke it forces the mixture through the pipe F and valve G into the working cylinder A while the piston C is performing its charging stroke. Owing to the difference in volume between the two cylinders, the mixture is considerably compressed as it passes from cylinder B into cylinder A. In this way, the charge is increased as compared with that which would have been taken in by the simple suction stroke of the working piston; and for a given compression there is an increased compression space, a correspondingly enlarged form of diagram, and an increase of power.

Coin-Counting and Registering Attachments for Prepayment Gas-Meters.—Burley, J. D. C., and Gilmore, A. E., of Stourbridge. No. 20,022; Sept. 17, 1903.

This invention is intended for use in connection with prepayment meters and coin-freed mechanism generally, for the purpose of automatically recording the number of coins inserted and indicating the total of such coins in pounds, shillings, and pence, so as to be read off at a glance, "thereby providing a check on the official who periodically collects the coins from the cash drawer of the meter."

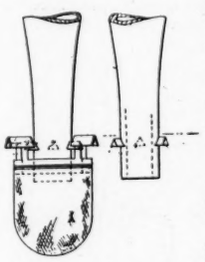
The attachment is primarily applicable to meters of the type in which the coin tendered in payment is made to form a temporary connection

between a hand-rotated drum worked by hand from the outside of the meter casing and a toothed winding wheel constituting part of the prepayment delivery mechanism, so that when the drum is turned by hand after the insertion of the coin (which falls partly into a notch in the drum and partly between two of the teeth of the wheel) motion is transmitted through the coin to the winding wheel, and the mechanism is wound up to the proper extent before the coin is discharged, whereupon the drum and winding wheel are disconnected so as to enable the former to be returned to its normal position. The mechanism is designed to be positively actuated by a deposited coin in the course of its movement with the drum and winding wheel of the meter mechanism; it being understood that a portion of the coin projects above the periphery of the drum while being carried round, and is capable of actuating or transmitting movement to a lever fitted within its path.

The casing or box which contains the counting and registering mechanism is preferably made of such a form as to admit of it being sealed on to or fitted on the top of that part of the meter casing wherein the drum and winding wheel of the meter mechanism are located, so that the attachment may be readily placed and secured in the position usually occupied by the cover-plate of the meter. In such an arrangement, the front of the casing is provided with an opening through which the figures indicated by the registering mechanism are displayed and can be read off at a glance, while the coin-slot through which the coins are inserted into the meter mechanism is formed in a convenient position on the top of the casing.

Supporting Mantles on Inverted Incandescent Gas-Lamps.—The New Inverted Incandescent Gas-Lamp Company, Limited, and Bridger, J., of Farringdon Avenue, E.C. No. 5356; March 4, 1904.

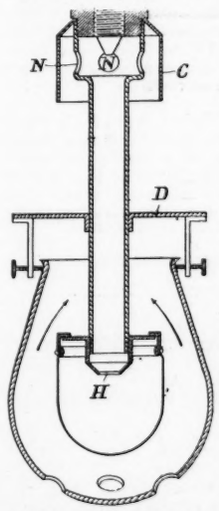
This invention relates to means whereby the mantles in inverted incandescent gas-lamps are securely retained in their proper position relative to the burner, and whereby, at the same time, their accurate adjustment and engagement are ensured. To this end, the mantle supporting ring has small blocks or distance-pieces (say three) from which spring or branch supporting devices or arms of such shape in cross section as to straddle or fit over or upon, or into, a corresponding number of triangular or equivalent shaped projections or lugs near the lower end of the burner tube. As an alternative, the supporting arms are formed at their inner end with a notch adapted to engage the upper ends or apices of the angular lugs or projections on the burner tube.



The illustration shows one of the means for supporting the mantle in place on the burner tube of an inverted lamp, as well as the lugs or projections thereon to receive the supporting ring and its mantle.

Inverted Incandescent Gas Lamps.—Kramer, E., of Berlin. No. 28,402; Dec. 24, 1903.

This inverted gas-burner ("to ensure the greatest economy, with a very high luminous efficiency") is illustrated in section.



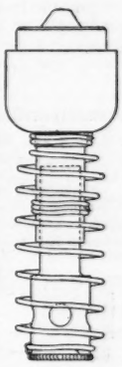
The gas enters the mixing tube from above, through the nozzle shown, and draws in air through holes N which are surrounded by a cap C. The formation of the flame takes place on the narrow mouth H of a mouthpiece screwed upon the mixing tube. The incandescing mantle is surrounded by a glass protecting globe, which, being a bad conductor, prevents the heat dispersing and directs the heated products of combustion in the direction indicated by the arrows, against the mixing tube, so that it is raised to an intense heat. In addition to this, the metal globe holder transmits a considerable amount of heat to the mixing tube, so that the gas and air are highly heated in the tube.

It is important, says the patentee, that the globe should be arranged at a certain distance below the plate D which deflects the heated products of combustion, in order that, on the one hand the gases may be able to escape here, and on the other that the burner may be ignited through this opening. "This arrangement presents the further advantage, that the explosion which takes place on kindling the burner is very small in the globe as compared with that which takes place on kindling burners which are provided with a chimney, as only an exceedingly small quantity of explosive mixture is able to collect in the glass globe. In this way, the life of the mantle is greatly prolonged."

In inverted burners as hitherto constructed, it is true (the inventor points out) that the flame had a blue-green core, though not so steady a one as in the present burner; but this core disappeared—more especially with low gas pressures—when the burner became well heated, and the flame became a white point; "which is a sure sign of imperfect combustion." In the burner which forms the subject of this invention, however, in a cold condition, owing to the co-operation of the wide mixing tube and its narrow mouth, the flame is so intense that even in the heated condition complete combustion is still produced. The flame is, therefore, very hot with a small gas consumption, and the mantle is raised to a high degree of incandescence. Owing to the great heat of the mixing tube, the whole burner becomes exceedingly hot, so that the crown, which connects it with the nozzle would become blackened. In order to prevent this, a washer of some non-conducting substance (steatite, porcelain, or the like), is arranged between the nozzle and the mixing tube, so that no heat may be transmitted from the burner to the crown.

Atmospheric Gas-Burners.—Ehmann, C. P., of Manchester. No. 2047; Jan. 27, 1904.

According to this invention, the lower part of the burner (the mixing chamber) is provided with a nozzle extending upwards and into a socket extending downwards from the upper part, which carries the burner proper and the mantle. The internal diameter of the socket is made so large that it has a considerable lateral play on the nozzle, and is also free to slide longitudinally on it. Extending from the lower part, and surrounding the latter, as well as the socket, is a spiral spring which takes the weight of the whole upper part of the burner and forms an elastic support or cushion. In order to normally keep the nozzle and the socket concentric with each other, and to impart a slight amount of rigidity to the whole appliance, coils of spiral spring embrace the socket, so that the burner is cushioned both longitudinally and transversely, as shown.



Rotary Gas-Engines.—Farwell, F. O., of Dubuque, U.S.A. No. 6199; March 14, 1904.

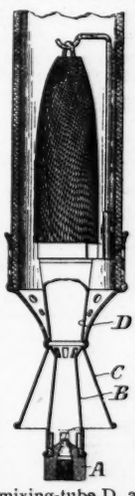
This invention in rotary engines (more particularly explosive gas-engines) has for its object to provide an engine of large power and high compression, in which the cylinders revolve in a horizontal plane about a stationary axis, whereby the engine is caused to serve as its own fly-wheel. This effects "a more perfect mechanical balance" and eliminates "the objectionable vibrations incident to the use of the ordinary type of engines when mounted on a yielding foundation, as, for example, a motor vehicle." The patentee provides means for keeping the engine cool without the use of a water-jacket; secures "perfect combustion of the explosive charge under all conditions;" secures a greater range of speed, and provides means for quickly changing the speed; deadens or reduces the noise of the exhaust; and eliminates any smoke from imperfect mixture of the charge that may issue from the cylinders.

Atmospheric Gas-Burners in Combination with Reflectors and Protectors for Same.—Cox, G. J., of Melbourne. No. 8153; April 9, 1904.

This invention has for its object "the more complete development and utilization of the heat potential in a mixture of gas and air undergoing combustion through the medium of atmospheric gas-burners, particularly when such combustion is proceeding under utensils in cooking and the like operations, and also to provide means whereby the atmospheric burners and combined apparatus forming this invention may readily be separated for cleaning purposes." The description of the invention occupies a lengthy specification (extending to eight printed pages) with three sheets of detail drawings, without which —and we have no room for their reproduction—the patentee's proposals are not explainable.

Heating and Incandescent Gas-Burners.—Rettich, V. A., of New York. No. 11,139; May 14, 1904. Date claimed under International Convention, Dec. 2, 1903.

This invention, relating to bunsen burners, has for its object the production of a burner "capable of burning a mixture of air and artificial or natural illuminating gas with an intense heat and with a flame that will raise a refractory substance—such as a mantle now in use in incandescent gas-lighting—to hyperincandescence." Another object is to produce a form of gas-burner in which a mixture of gas and air can be made that will "more nearly approach perfect combustion than has been heretofore possible with burners of this class, thereby producing a much more intense heating flame."



As shown, there is only a small opening or jet orifice through which the gas flows to the lower mixing tube. Surrounding the jet orifice, and screw threaded to the nipple A, is an upwardly converging mixing-tube B, provided with air-inlets at its lower and upper ends. C is a downwardly diverging shell attached to the mixing-tube D, above the upper air-inlets and extending downward, surrounding the mixing-tube. D is an upper suction-tube, which aligns with the mixing-tube B and diverges upwardly and forms a secondary mixing-chamber in which to mix with the gas the air which flows inwardly through the upper air-inlets. It will be seen that the lower opening of the upper mixing-tube D is larger than the opening in the lower mixing-tube B near the air-inlets. The purpose of this is to allow the gas to expand as it flows out of the upper end of the mixing-tube B and enters the secondary mixing-tube D, and "thereby more thoroughly mix with the air, raising it more nearly to the perfect combustion point."

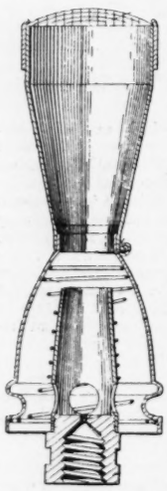
The operation of the burner is as follows—it being assumed that the gas in the pipes is under the ordinary pressure: On opening the cock the gas rushes upwardly through the jet-orifice, and creates a vacuum near the lower air-inlets in the lower mixing-tube B, thereby inwardly drawing air to mix with it. The mixture of gas and air then continues upward, gradually compressing, due to the tapering of the mixing-tube, until it reaches the upper end of the tube. It is then discharged

upwardly with considerable force into the mouth of the second mixing-tube D, which is larger than the opening in the lower mixing-tube, and which discharge of gas and air in turn creates a vacuum in the lower end of the mixing-tube D—thereby drawing additional air inward through the upper air inlets. The gas and air drawn in continuing upward expands, allowing it to be thoroughly mixed with the air before being discharged at the combustion point at the burner-head.

By surrounding the lower mixing-tube B with the outer shell C and carrying the lower end of it down for a considerable distance upon the mixing-tube B, it causes the device to act as an inspirator and draw air upwardly in the shell C through the upper air inlets into the upper mixing tube D, and thus prevents any outward escape of the gas.

Incandescent Gas-Burners.—Rettich, V.A., of New York. No. 11,266 May 16, 1904. Date claimed under International Convention, May 27, 1903.

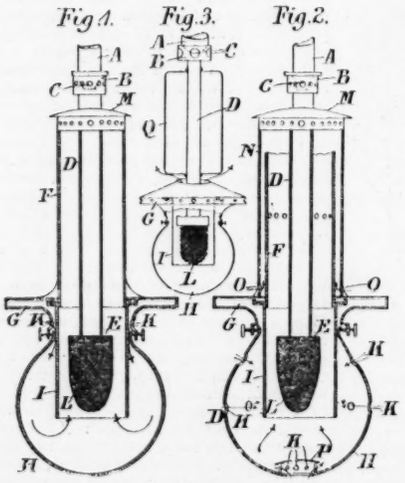
This invention, relating to bunsen burners, has for its object the production of a burner which is capable of burning with a flame that will raise a mantle to hyperincandescence. The patentee claims that it enables the hyperincandescent flame to be formed with an outer zone of such length that much longer mantles may be used than usual. Yet, he says, the entire length of the burner remains approximately the same as for a Welsbach burner, enabling the burners to be grouped or assembled in various ways that are impractical with the longer-shanked bunsens. Furthermore, the burner offers a ready means for rendering it proof against the destructive shocks caused by vibration; it is readily taken apart for regulating and cleaning purposes; and each burner embodies in its construction a suitable base or platform on which it may stand and safely support the mantle when occasion arises to remove it from its normal burning position.



As shown, the burner is constructed with the usual small jet-orifice, through which the gas issues in a fine stream under the influence of the gas pressure, and then forms an air and gas mixture by the use of an upward and inwardly tapered conical tube or lower bunsen section provided with air-apertures in close proximity to the jet-orifice. This inwardly tapered conical tube is from 1 to 2 inches in length, and is arranged within an outer shell that is freely open to, and readily admits, the air. The outer shell carries a top bunsen section, preferably of an outwardly flaring form arranged so that its lower end is from ¼ to ¾ inch removed from the top opening of the lower bunsen section. This compels the air encased by the outer shell to mingle with the air and gas mixture propelled upwardly from the lower bunsen section at the space between the lower and upper bunsen sections. The completely mixed gases then pass with increased velocity into the upper bunsen section or suction tube. The upper tube is provided with a gauze or equivalent combustion head; and there is a helical spring having a central portion which fits the lower bunsen section, and upper and lower portions of larger diameter. This spring is slipped over the lower bunsen section as shown, and is thus supported thereon.

Inverted Incandescent Gas-Lights.—Wolff, L., of Berlin. No. 13,488; June 14, 1904.

This invention relates to an incandescent gas-lamp having a suction pipe, in which lamp the gas outlet aperture of the burner-head is not directed upwards, and also to a lamp having a gas discharge outlet directed either downwards, obliquely downwards, or horizontally—but not in an upward direction. The air necessary for forming the flame is only indirectly conveyed to the place where the flame is found and exclusively by a suction pipe connected with the cylinder surrounding the mantle.



In fig. 1, A is the gas supply pipe, B the nozzle, C the air inlet aperture for the nozzle, D the mixing pipe in which the gas is mixed with the air in the ordinary manner, and discharged at E from the burner head. F is the suction pipe, G the reflector on which the glass bell H is preferably mounted, I a cylinder surrounding the incandescent body or mantle, K the air inlet apertures through which the air which flows over the incandescent body L enters and is drawn off through the suction pipe. The gases of combustion pass out at M.

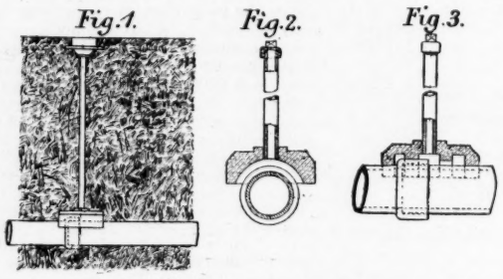
Fig. 2 shows, in addition to the actual draft pipe F, a casing N surrounding it and having at O air inlet apertures serving for cooling the suction pipe. It also shows the air inlet apertures K placed differently from fig. 1—for instance, at the sides of the glass bell, or beneath the glass. In the latter case, however, the aperture must be provided with a protective hood or cover B as the requirements must always be fulfilled that the air for combustion drawn in from the outside on entering the bell or globe, shall never directly encounter the incandescent body.

In cases where the suction pipe does not need to extend the entire length of the mixing pipe D, the pipe (as shown in fig. 3) may be surrounded by a casing Q or shell of suitable form, in order to protect the lamp, when used for outdoor lighting or in damp places, from oxidation, or, if the mixing tube be not formed of metal, to protect it from other influences. In order to keep the mixing tube cool, air holes may be provided in the shell of the casing Q. When these are arranged in the lower end of the casing, a plate is placed beneath them in order that the hot waste gases may not encounter the mixing pipe D in the casing.

Locating Leakages in Underground Gas-Conduits.—Wilhelmi, O., of Berlin-Zehlendorf, Germany. No. 15,316; July 8, 1904.

This invention has for its object to provide means for rapidly and easily locating leaks in street gas-mains without risk of damaging cables or leaden water-pipes in the vicinity of the gas-pipes.

Fig. 1 is a longitudinal section of a street, showing a joint of a gas-main and a device for conducting to the surface any gas that may escape from it. Figs. 2 and 3 show on a larger scale a special form of device for leading off the leakage from gas-mains.



The patentee proposes to provide at each pipe-joint an outlet or duct to lead any escaped gas to the street surface. The duct is to have a foot or base of earthenware, concrete, or impregnated wood, asphalt, or other suitable material, which simply rests on the joint or on the adjoining parts of the pipe, and forms a support adapted to maintain the outlet duct in a vertical position. Each base-plate would preferably have in its underside a cavity or cavities, to facilitate the collection of the gases and their escape into the outlet pipe. The upper end of the outlet pipe is to be closed by a screw-cap or other device, protected from injury by a box sunk into the surface of the street, and provided with a removable cover.

On a smell of gas being noticed in any street, says the patentee, it would only be necessary to open the nearest pipes "and then to ascertain by the sense of smell or by introducing on to the pipes a sensitive chemical reagent, whether gas escapes through any of the pipes. In this manner, the leak may be discovered in a short time, without damaging any other conduits and without disturbing the street traffic."

APPLICATIONS FOR LETTERS PATENT.

18,133.—Apps, H. J., "Incandescent burners." Aug. 22.
18,214.—Hatton, G., "Gas-producers." Aug. 23.
18,266.—Leinert, W., "Meters." Aug. 23.
18,272.—Spreadbury, R. J, "Inverted incandescent lamps." Aug. 23.
18,281.—Thurnauer, L., "Gas fittings." Aug. 23.
18,283.—Carter, W. C, "Manufacture of sulphate of ammonia." Aug. 23.
18,285.—Brownhill, E., "Gas-governor." Aug. 23.
18,291.—Cotton, F., "Generating gas." Aug. 23.
18,328.—Burri, R., "Gas regulators." Aug. 24.
18,364.—Verdier, J., and Teulon, P., "Gas-retorts." Aug. 24.
18,382.—Féry, C., and La Compagnie pour la fabrication des Compteurs et Materiel d'Usines à Gaz, "Pyrometers." Aug. 24.
18,435.—Aktieselskabet Elling Compressor Company, "Gas-turbines." Aug. 25.
18,456.—Shiels, A., "Manufacture of gas." Aug. 25.
18,474.—Hemingway, G. E., "Gas and water pipes." Aug. 26.
18,487.—Junkers, H., "Determining the heating value of fuels." Aug. 26.
18,520.—Beaumont, F. J., "Coin-freed meters." Aug. 26.
18,529 —Walker, E. C., "Acetylene generator." Aug. 26.
18,550.—Clayton, R., and Whitehouse, E., Gas fires or stoves." Aug. 27.

The Gas and Electricity Committee of the Belfast Corporation have decided to pay the widow of Hugh M'Mahon, who, as reported last week, was poisoned by gas while working at a main in College Green, the sum of £150, the minimum amount fixed by the Act.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The South Suburban Gas Company's Circular and Carburetted Water Gas.

SIR,—The circular recently issued to the consumers of the Crystal Palace District Gas Company has attracted a considerable amount of attention from others than those to whom it was addressed. Several consumers in other suburban districts have sent me the circular, with inquiries as to its accuracy; and their curiosity is intelligible enough, inasmuch as the statements in the circular, if true, cannot apply exclusively to any particular area of gas supply.

As some years have now elapsed since I had anything but an abstract interest in engineering practice, either with regard to carburetted water-gas or otherwise, I venture to submit the following comments upon the circular, not from the point of view of those promoting the use of, or of those using, carburetted water-gas plant, but from the broader standpoint of those responsible for the distribution of gas generally.

The use of carburetted water gas is now so general in the case of the more important gas undertakings in this country, that its manufacture is rather the rule than the exception. If the statements in the circular referred to are well founded, those responsible for the use of carburetted water gas were wrong in its adoption, and are unwarranted in its continued production; and it follows that, if the terms of the circular are true, they would best serve the interests to which they are committed by its immediate discontinuance.

Putting the arguments of the circular temporarily aside, and going directly to ascertainable facts, an analysis of the accounts of those who have used, and are now using, carburetted water gas, shows that, in very many such cases, carburetted water gas, irrespective of the higher illuminating power necessary to effect all desired enrichment, is cheaper, by itself, than the coal gas it enriches; and this would be even more frequently the case, if the proportion of carburetted water gas used were more intelligently adapted to the circumstances.

Apart from the separate cost of producing carburetted water gas, the fact has to be considered that coal gas made in co-operative association with it, is necessarily produced at a considerably lower cost than it could be produced by itself, by reason of the facts that the expensive irregularities of mid-winter working are avoided; that the utmost quantity of gas can be extracted from the coal, without regard to the necessity of subsequent enrichment; and that the residual market is kept under control, and the price of residuals is thereby considerably accentuated.

It may well be contended by the light of the subjoined statements, that the enhanced value of residuals in the United Kingdom to-day is an outcome of the extended use of carburetted water gas. It will be difficult to refute the contention that all coal gas production in England enjoys at the present time this latter advantage of co-operative production with carburetted water gas, by reason of the proportion of the latter that is now regularly produced.

So far as can be ascertained from the Government Returns the production of illuminating gas in the United Kingdom, if effected entirely with coal at the present time, would require, in round figures, about 16 million tons of coal a year. There are now, however, only about 14 million tons of coal used annually in the manufacture of gas in Great Britain. Therefore the manufacture of carburetted water gas may be approximately taken as relieving the demand for gas coal to the extent of 2 million tons a year.

Now, in the year 1900, the price for coal paid by gas companies in the vicinity of London, rose 50 per cent., and over. Whatever may have been the temporary causes of this advance in price, a commensurate demand for coal for gas making was not one of them. Even at this time, over 10,000 million cubic feet of carburetted water gas was being produced annually, with its consequential relief to the demand for gas coal. To any reasonable mind, the phenomenally enhanced price of gas coal that obtained in 1900—largely from causes of a temporary and indirect character—is overwhelming evidence of the fact that the coal account of this country is already heavily overdrawn.

Sir Frederick Bramwell, writing on this subject in "The Times" of Sept. 25, 1901, referring of course to the entire national supply, said: "Is it too much to say that, having regard to our *rapidly falling stock of coal*, it is a positive sin to spend five times the needed amount."

Now assuming that the obvious suggestion of the circular was acted upon consistently by gas undertakings, what would the price of coal be to-day with a further annual demand of about 2 million tons of gas coal? Could it fail to send the price up to a figure utterly inconsistent with the present selling prices of gas? This contingency, however, cannot be considered alone.

The discontinuance of the manufacture of carburetted water gas at the present time, would have the unavoidable result of throwing something like 1½ million tons of additional coke on the British market. Between the years of 1885 and 1900, coke was sold at and under 7s. f.o.b. in the Thames, for transport to America and the Continent. In 1897, clearances from the yards of north suburban gas companies were made at a corresponding price. The price to-day in the Thames for contracts is 12s. 6d. per ton; and about 16s. per ton in the North London suburbs. Where would these prices be if the production of carburetted water gas was discontinued? What would be the effect upon the price of sulphate of ammonia?

I would suggest another consideration that will, I think, recommend itself to any temperate treatment of the subject. Is it not patent that the undertaking that can draw its supplies of raw material from its own coke yard and from the large oil depôts in this country, in addition to drawing it from the collieries, must be in a more secure position than the undertaking dependent on collieries and collieries only.

There is yet another point to consider before the production of carburetted water gas can be disparaged. The capital involved, under an average of circumstances, for the production of carburetted water gas, is about half that attaching to the production of coal gas. If therefore the profit per 1000 cubic feet of carburetted water gas were only one-half of the profit obtained per 1000 cubic feet from coal gas, it would still be equally remunerative; whereas, as I have said before, in very many cases its cost of production is less than that of coal gas, and would be almost invariably so, were it not for the economies that its production automatically institutes in coal gas working, even where the latter is not produced on the same works.

Coming to the allegations in the circular in regard to carburetted water gas from the consumers' point of view, an examination of the published accounts of the Crystal Palace Gas Company shows that it has not distributed in any half year as much as 25 per cent. of carburetted water gas, yet it is contended that difficulty has been experienced in its distribution. Many of the undertakings in the North of London distribute 50 per cent., and over 50 per cent., of carburetted water gas without the experience of any such difficulty. How is it that companies distributing more than double the proportion of carburetted water gas, than in the case of the Crystal Palace Gas Company, have not encountered the trouble referred to?

It is further urged in the circular, that combustion under the incandescent mantle is less satisfactory with carburetted water gas as an ingredient than with plain coal gas. This statement is absolutely opposed to the actual experience of those using carburetted water gas in large proportions. It is true that the theoretical calorific power of carburetted water gas is slightly less than that of coal gas of equal illuminating power; but carburetted water gas is a gas more closely adapted to the purposes of economic combustion, by reason of the smaller amount of air necessary to this end, and this fact, taken with its slightly higher flame temperature, is a practical set-off to its theoretical deficiency. Of course, in the case of either gas being used, a proper adjustment of the air supply and pressure is necessary in regard to their respective requirements.

The public lighting of the streets in districts where a high percentage of carburetted water gas is distributed, is admittedly satisfactory. For example I may say there is no finer public lighting in London than that of the Hornsey district, in which varying, but always considerable, percentages of carburetted water gas are employed.

Coming after the Governmental inquiry of 1898 and by the light of the evidence given by at least one of those responsible for the issue of the circular, the allusion to the poisonous qualities of carburetted water gas is negligible, except so far as it exhibits a disingenuousness of argument that is complete evidence of the weakness of the case in support of which it is adduced.

A. M. PADDON.

4, *Brick Court, Middle Temple, E.C.*,
Sept. 2, 1904.

Engineers and Contractors.

SIR,—I am reluctant to trespass further upon your space; but "misrepresentation" is an awkward charge to make in business life.

In the first place, Mr. Jones needs correction, although the operation may partake somewhat of the nature of "cutting blocks with a razor." The words "on several occasions" did not occur in my previous letter. Secondly, I need refer Mr. Jones to one extract only, from the file of the "JOURNAL," as my reply to his charge: ". . . be in the hands of the contractors, he (the President) could only pray he might be delivered from them." The President (Mr. H. E. Jones) in the discussion of the paper on the "De Brouwer Stoking Machinery at Derby"—see "JOURNAL," Vol. LXXXVI., p. 777. The report in another technical paper ("Gas World," Vol. XL., p. 1081) gives the same spirit to this deliverance, but in language more emphatic. Surely the inference to be drawn is clear enough. It would not be difficult to give further instances of the ex-President's expressed opinions; but it is neither necessary nor desirable to do so.

The foregoing speaks for itself, and needs no amplification. The "personal equation" as, unfortunately, introduced by Mr. Jones in the closing remarks of his letter, does not concern the matter.

Hull, Sept. 1, 1904. J. HOLLIDAY.

Gas Purification by Ammoniacal Liquor.

SIR,—I am glad to see that this subject has received practical attention, and shall peruse Mr. Holgate's articles with great interest.

I have always advocated the use of liquor for purification; and it has ever been a matter of wonder to me that such an important question should have been so long in securing the attention it deserves. The general theoretical aspect of the case is well known; but it will be most interesting to have details of practical working with respect to comparison with the use of lime.

As a curious coincidence, I had given the question some serious attention in an article of mine which you have in type but the publication of which has been delayed.

H. LEICESTER GREVILLE.

Sept. 1, 1904.

The New Patent Office Procedure.—In the "JOURNAL" for Aug. 23 reference was made to the fact that the Patent Act, 1902, comes into force at the beginning of next year, and some particulars were given of the altered mode of proceedure that this would involve. The Board of Trade have since issued an order setting out the rules made in regard to (among other things) the examination to be conducted as to the novelty of inventions submitted to be patented. In the course of a letter on this subject, Messrs. W. P. Thompson and Co. say: The system of examination thus instituted is much less perfect than those of other countries, as the examiner has merely to search through the British patents of the immediately preceding fifty years to see if in these there be, in his opinion, any anticipation of the invention set forth in the complete specification. This report is forwarded to the Comptroller; and if the Comptroller be of the opinion (from the report) that the invention is partly or wholly anticipated, the applicant

is informed of the anticipation, and has the option of a personal hearing or of amending the specification to the satisfaction of the Comptroller. In default of either, the Comptroller determines whether a reference to any, and if so what, prior specifications must be made in the specification by way of notice to the public. Against his decision, there will be an appeal to the Law Officer. The examiner's reports will be kept strictly secret from all but the applicant and his agent; but this examination must not be held in the slightest to guarantee in any way the novelty of the invention, or the validity of the patent, as of course the prior publication of the invention in other documents open to the public in England prior to the date of the application, or the prior public use of the invention, would be equally as fatal to the validity of the patent as the publication of the invention in a prior British specification.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, Aug. 3.

(*Before Mr. Justice* SWINFEN EADY.)

Soothill Upper Urban District Council v. Wakefield District Council and East and West Ardsley District Councils.

This was an action brought by the Soothill Upper Urban District Council against the above-named Local Authorities, to recover £890 for water they had not taken, on the footing of a minimum daily quantity, under an agreement entered into in 1895.

Mr. EVE, K.C., and Mr. E. CLAYTON appeared for the plaintiffs; Mr. MICKLEM, K.C., and Mr. R. J. PARKER for the defendants.

Mr. EVE said the action was brought to recover £890 under an agreement of January, 1895, for water which the plaintiffs contended the defendants ought to have taken from them in order to make up a minimum of 100,000 gallons a day, which they were bound to take. The agreement was made with the Wakefield Rural District Council. But they denied responsibility—contending that the agreement had been taken over by the Ardsley Council; and accordingly that Council was made a party. The amount claimed related to the period between June 22, 1899, and March 21, 1902. The question of the liability of the taking Council to pay for water up to a minimum, though not taken, had been the subject of more or less perennial dispute since the parties first came into relation on the water question in 1882. The previous claims had been settled by the plaintiff Council taking less than they claimed; but now the parties had decided to submit their rights for determination by the Court. Under the agreement, a very curious point arose. The agreement was made with the Rural District Council for the supply of water for the requirements of the two parishes, as they then were, of East and West Ardsley. Since the agreement was entered into, the two parishes had been constituted an urban district, and water had continued to be supplied; but payment had been made and had been received direct from the Ardsley Council. The accounts had, however, always been made out, and receipts given for and to, the Rural Council. There was no contract in writing between the plaintiffs and the Ardsley Council; and when the action was started the Rural Council alone were defendants. They, however, applied to have the Ardsley Council added as third parties; and plaintiffs elected to make them defendants. The Ardsley Council then counter-claimed for damages. The first point raised by the defence was one of law, and went to the root of the agreement. They contended that the agreement under which plaintiffs claimed was invalid on the ground, as they alleged, that it had not been sanctioned by the Local Government Board; and, having regard to the form of the contract, it was not one that could be enforced, because it did not contain any provision for a penalty on the part of the taking authority. By the contract in question, plaintiffs agreed to supply defendants with water, on the terms that the latter should not take less than 100,000 gallons and not more than 125,000 gallons per day of 24 hours. The daily quantity taken was to be at the option of the Rural Council; and it was in respect of the minimum that the question arose. Plaintiffs said that defendants had not taken 100,000 gallons a day; and the defence to this was that they had not done so because the plaintiffs had failed to supply it at a pressure which enabled them to take it.

Justice SWINFEN EADY pointed out that there was nothing about pressure in the agreement.

Mr. EVE said his Lordship would find that there was, but only under circumstances which had not yet occurred. The whole difficulty had arisen because the Ardsley Council had found that they could get the water a little cheaper from the Morley Corporation; and as their supply from them increased, that obtained from the plaintiffs diminished.

Evidence was then given by Mr. *L. W. Taylor*, the Solicitor and Clerk to the plaintiff Council, and by Mr. *I. Blackburn*, their Surveyor and Water Engineer, substantially bearing out the learned Counsel's opening statement.

Thursday, Aug. 4.

On the resumption of the hearing,

Mr. *Blackburn* was cross-examined. He said that all the water taken by the plaintiffs from Halifax was either sold or disposed of in some other way. He did not know that Soothill lay lower than Ardsley; both had their high and low levels. The highest at Soothill was 450 feet. Before entering the Ardsley pipes, the water passed through two meters and a 6-inch main to Tingley, 460 feet. Then there was a connection with the Morley water. He had seen the tank at East Ardsley Station, but could not say how it was supplied. He should be surprised to hear that when the water was cut off for seven hours the people in East Ardsley had no water for two or three days a week. On the 6th, 7th, and 8th of May, 1900, the water was shut off for twelve hours in consequence of a burst. The cutting off, as a rule, would be at the reservoir. Substantially, the two meters agreed, and there had been no question between the parties as to the quantity of water supplied. In June, 1900, his Council were themselves short of water. At that time they were negotiating with the Ardsley Council with regard to putting in a new main. He did not know that it was agreed that until the new main was completed only 75,000 gallons a day should be supplied. The average pressure shown by his books was, he thought, sufficient to supply Batley under ordinary circumstances.

Mr. *James Watson*, the Water Engineer to the Bradford Corporation, said that, in his opinion, plaintiffs' works were sufficient to enable them to fulfil their obligations under the agreement. In cross-examination, he said he had not examined the Ardsley system, nor had he been supplied with any plan of the mains. He did not know the Ardsley district, and therefore could not say that the pressure used by plaintiffs was adequate for its supply; but he could say that at the meter-house the pressure was sufficient to throw the water to a height of 515 feet, and send to the ends of the mains 248,000 gallons a day.

Mr. *John Waugh*, of Bradford, said plaintiffs' system of water supply was a natural one, and in working order. Great fluctuations were incidental to the pressure.

This closed the plaintiffs' case.

Friday, Aug. 5.

Mr. MICKLEM, in opening the case for the defence, said the first point he desired to make was that the agreement in question was void, because it did not in form comply with the requirements of the Public Health Act, 1875. In accordance with section 61 of that Act, an urban sanitary authority had power, with the sanction of the Local Government Board, to supply water to a district outside their own. Before that year they could not have done it without a Special Act; and the section only authorized them to do it with the permission of the Board. The agreement was made under the Public Health Act, and therefore the sanction of the Board was necessary; and as this was not obtained, the agreement was void. It would be necessary for him to go through the agreement, as, apart from his first contention, he submitted that there were very important questions of construction upon it. His first submission would be that there was an express provision for a supply of water to a particular district; and, apart from any express provision, there was an implied agreement to deliver it at such a pressure as would supply the district. This he contended would be the *primâ facie* meaning of the agreement if there were no express provision. Of course, the pressure would vary; but it must be sufficient to supply all the reasonable requirements of the occupants of the houses. When there was enough water, it was kept on over the whole district; but when they were bound to take water from Morley, the Soothill water was sent to a particular part of the district. There were no houses now at a higher point than there were at the date of the agreement. He should contend that all the agreements which had been entered into were void; but if there was anything in the plaintiffs' point that those of 1882 and 1885 were subsisting, it did not help them, for the defendants had taken water considerably in excess of the minimum under the old agreements. The agreement in question provided that it should be void if the sanction of the Local Government Board could not be obtained, unless it was found that this sanction was unnecessary. The way the Local Government Board treated the matter was to say that if the district was the same as that to which they had already given their sanction, nothing further was necessary. There could be no doubt that the district covered by the agreement of 1895 was larger than that dealt with by those of 1882 and 1885. It was obvious that the sanction of the Local Government Board had never been obtained, and the contract was therefore *ultra vires* and void. Dealing with the position of the different defendants, Counsel said that, though he was appearing for both, up to the hearing they had acted independently, and by separate Solicitors. His submission was that the Rural District Council were not proper parties to the action; their rights and liabilities under the agreement having passed to the Ardsley Council. The plaintiffs suggested that the agreement would have been complied with if the defendants had put a pipe in the meter and had drawn off the minimum quantity; but he maintained that this was not so. The plaintiffs were bound to tender the supply. His Lordship would bear in mind that the water the plaintiffs were seeking to charge for was not water that they themselves had paid for. They had never obtained this water from Halifax and passed it on to the defendants. The plaintiffs had suffered no damage whatever unless it was the difference in price they would have received from the defendants and that at which they could have got it from Halifax. The plaintiffs admitted that they must supply the water at some pressure, and they had put in a number of averages for the purpose of showing that it was adequate. He submitted that those averages were misleading. The Ardsley Council would have taken the Soothill water if they could have got it, as it was better for domestic purposes than the Morley water. They could not, however, get it, and it was necessary that something should be done for the health of the district. This being the case, they, in 1897, came to a temporary arrangement with Morley. The same state of things continued through 1898—the upper districts of Ardsley being without water. It was a strange thing that these defendants should be charged with water they did not take, when the correspondence showed that they were continually asking for water they could not get. It could not possibly be the true construction of the agreement that they were to pay for water they were calling for and could not obtain. It was true that on some occasions when the pressure was higher, less water was taken. This was accounted for by the fact that for some days more water would be used than on others. Whatever the quantity taken, however, the pressure would not satisfy the defendants unless it was sufficient to carry the water to their highest levels.

Evidence was then given on behalf of the defendants.

Mr. *E. Brooke*, examined by Mr. MICKLEM, said he was Surveyor

and Water Manager to the Ardsley District Council. He had held the latter position since October, 1890, prior to which date he was for some years Assistant-Manager to the Dewsbury Council. Since 1895, he had had the water supply under his own control. The meter-house was in existence in 1890, and there were in use 3-inch Siemens meters. In 1893, a Kennedy meter was put in. Witness then, with the plans, described in detail how the pipes ran in 1890. The water left the meter-house by a 5-inch main. There were some 3-inch mains in the poorer district of East Ardsley, and some lengths had been added. There was a supply to Brockwell when he took office. It was by a 5-inch pipe. Witness proceeded to describe the system which brought in the water from Morley, which, he said, was put in in 1896. There was some litigation, and an injunction was obtained, which prevented the Morley people from passing the water along. In 1898, however, the Ardsley Council concluded an agreement with Morley. The supply began on July 7, 1897; but the 6-inch pipe was not put in until 1898. The regular supply from Morley, however, did not start until September, 1897. From that time onward water had been taken from Morley. The reason they had the temporary supply was the scarcity of water coming from Soothill. The present supply from Morley was first turned on in October, 1897; but it was not until December of that year that it became regular. In his opinion, the water taken from Morley could not have affected the Soothill meters.

Saturday, Aug. 6.

Mr. *Brooke*, in further examination by Mr. MICKLEM, said that to supply the Great Northern tank and the whole of the Ardsley district with water meant that not less than 80 lbs. pressure was required at the Soothill meter-house. Some of the defendants' pipes were taken up because it had been suggested that an obstruction in them caused diminution of the flow of water. Some incrustation was found and scraped off in 1893. Since then they had had no occasion to examine any of the mains in the Ardsley district. He had taken part in examining the Soothill mains. In 1893, he was asked to assist in scraping one of the 6-inch mains. Some stones were found in the pipe, and at one place a 5-inch pipe had been inserted in the 6-inch main. Then, in 1893, he was asked by the Soothill Manager to assist in taking out the 6-inch meter from the 10-inch pipe. The result of the meter being there was that, though the pipe was a 10-inch one, they only had the flow of water of a 4-inch pipe. Subsequently he saw Mr. Blackburn about the Soothill mains. In October, 1898, he also saw him in reference to the meters. Together they inspected a pressure-gauge, and found that, in going through the meter, the pressure fell from 7 lbs. to 10 lbs. In consequence of what they found, Mr. Blackburn agreed to send the water direct through the pipe. He kept records of the pressure at various times, and from these he had prepared a table of results. They extended from March, 1897, to January, 1902; and he tabulated them so that he could ascertain the days when Ardsley could not get the necessary water. The tables showed that in one day the variation in pressure was very great. They always had a better pressure on a Sunday.

A number of letters were produced, but not read, containing complaints by ratepayers of lack of pressure.

Monday, Aug. 8.

On the resumption of the case this morning,

Mr. *Brooke* was cross-examined by Mr. EVE. He indicated on the map the mains, referred to in his evidence-in-chief, where 3600 gallons of water were being discharged into a pond. The point of discharge was as high as the meter-house. When the Soothill water was passing to East Ardsley, it went up the 6-inch main, then along a 5-inch main, and finally into a 4-inch main. There was a time when they had not the Morley water, and when they were carrying Soothill water to East Ardsley. His view was that the 3-inch pipes really assisted the flow of the water.

Mr. EVE: Supposing that view is not hydrostatically correct, have you any idea of the loss of water occasioned by sending 75,000 gallons of water through the 4-inch and 3-inch mains?

Witness: I have not.

What were the requirements of the Ardsley district in 1895?—About 120,000 gallons per day.

Mr. MICKLEM here obtained leave to ask a question which he said ought to have been put in his examination of witness as to the possible incrustation of pipes.

Witness produced a specimen of an incrusted pipe through which the Halifax water had flowed. It was 6 inches in diameter, and it showed a common form of incrustation with that water.

Mr. *Frank Massey*, of Wakefield, said he had knowledge of the water undertakings around that town, and had practical control of the water supply for between 30,000 and 40,000 people, holding the position of Water-Works Manager to the Wakefield Rural District Council. In connection with the agreement of 1895 between the Soothill Council and the Ardsley and Wakefield Councils, he was employed to assist in the negotiations; and he discussed them with the Engineers of the Soothill Council. He was well acquainted with the Ardsley and Soothill mains, and he agreed with Mr. Brooke's description of them. In witness's opinion 500,000 gallons were necessary to secure the maximum flow for Soothill; and he based his calculation upon Mr. Watson's figures. The pressure records produced by Mr. Brooke varied. It was not fair to take an average pressure for twelve hours only, as sometimes for four or five hours it was utterly impossible to take the average. It was much fairer to take it for 24 hours. His opinion was that the pressure given had not been sufficient to allow the Ardsley people to take 100,000 gallons per day.

Mr. *C. H. Gott*, of Bradford, corroborated this evidence. He said he did not consider the flow of water from Morley could in any way check the flow of water from Soothill. In cross-examination, he affirmed the apparent paradoxical principle that when the pressure was low the consumption was high, as consumption and pressure did not, he said, always vary.

Mrs. *S. H. Briggs*, Head Mistress of the East Ardsley Board School, said she had been there more than ten years, and the water supply at the school was most unsatisfactory.

Mr. *E. J. Silcock*, of Leeds, also gave evidence.

Tuesday, Aug. 9.

Mr. *Silcock*, further examined for the defence this morning, said that it would require a pressure of 80 lbs. at the meter-house to carry the water over the Ardsley system.

Mr. *Holliday*, a member of the Water Committee of the Ardsley Council, gave evidence as to the complaints received about the water supply prior to 1897. He said that in consequence of these complaints the Council were bound to do something, so they went to Morley. They did not wish to go, as they feared it would tie them to their disadvantage.

Mr. PARKER, in summing up the case for the defendants, submitted that it was to their interest to take the Soothill water, as they could get it cheaper than any other, and it was to the plaintiffs' interest to prevent them from getting it.

Mr. EVE having been heard in reply,

His LORDSHIP intimated that he would consider his judgment.

Scott-Snell Self-Intensifying Gas-Lamp Company, Limited.

On the application of W. B. Peat and J. F. Pease and Co., Limited, who had recovered judgment against the Company for £655, and had failed to get payment, Mr. Justice Bigham (Vacation Judge) on Wednesday last made the usual compulsory order for winding up. The Company appeared by Counsel, and did not oppose the order being made. Mr. Galbraith appeared for the petitioners.

An Illegal Connection with a Gas-Main.

At the Thames Police Court last Thursday, the proprietor of a public-house in Mile End was charged with causing a pipe to be laid to communicate with one belonging to the Commercial Gas Company, with intent to defraud. Mr. Young, who prosecuted, said the proceedings were taken under section 18 of the Gas-Works Clauses Act, 1847. The defendant might have been charged with stealing gas; but the Company had taken a more lenient course. James King, a service-layer, said on May 20, he went to defendant's house and disconnected the supply of gas, by taking the inlet off the meter and capping the service tightly. Harry Foster, a gas-fitter, stated that on May 24 he went to the public-house, and took the index of the meter. It then registered 6200 cubic feet. The meter was behind the counter. On Aug. 2 he again went to the house, and the meter then registered 22,900 cubic feet—showing a consumption of 16,700 cubic feet. Henry Smith, a foreman fitter, said along with one of the Company's servants named Ellis he went to the defendant's house at about 7.30 on the evening of Aug. 12. Before they went into the house, he saw gas burning in the bar-parlour. Defendant's wife was there, and she called her husband. Witness told the latter he had called to see the gas-meter. Defendant replied, "I don't know why you want to see the meter. I am not burning your gas." Witness asked to be allowed to see the meter some half-dozen times; but defendant refused to allow him. As defendant came into the bar-parlour witness saw his hand go up, and the light was extinguished. On Aug. 13 he again went to the house, and defendant refused to allow him to see the meter. Witness threatened to open up the road, and was then allowed to see the meter, which he brought away. At that time, the cap on the service-pipe was loose, and the meter registered 24,900 cubic feet. Defendant having called a witness, asked for an adjournment to get others. The Magistrate said defendant had known of the matter for some time, but had not troubled to get the witnesses. He did not see any reason why the Company should be put to the inconvenience of again bringing their witnesses to Court, and defendant would be fined £5 and 23s. costs or, in default, 21 days' hard labour.

Aberavon Gas Supply.—For the first time in their history (which goes back to 1865) the Aberavon Gas-Works have been a financial success. The statement of accounts for the year ending March 31 last shows a net profit of over £400. For a long time the works have been rate-aided, to the extent in some years of more than £700. In the year 1902-3, there was a deficiency of over £300, after repayment of capital charges. Thanks, however, to the energy of the present Manager (Mr. Arthur Bond), and to the attention bestowed on the work by a good practical Committee, this deficiency has now been turned into a profit of over £440.

Acetylene Lighting in the Southport District.—Last Saturday week, on the occasion of the lifeboot demonstration, the British Acetylene Gas Company, of Liverpool, made a brilliant illumination, free of charge, on Southport Pier and at the tram terminus. The light was much admired. Altogether about 3500-candle power was furnished. On the following Monday, there was an acetylene installation opened at the Catholic Club, Formby. The interior of the club is lighted with 75 burners, of an average capacity of 30-candle power each; and there are also stoves for heating, the largest of which burns 10 cubic feet per hour. Four standards illuminate the bowling green, with a light of 1060 candles. The total power of the installation is 2250 candles.

Profit-Sharing in Gas-Works.—The report presented at the annual exhibition of the Labour Co-Partnership Association recently held at the Crystal Palace contained the following particulars as to profit-sharing in gas-works. The number of employees who agree to share and the total profit to employees are: South Metropolitan Gas Company (4598), £256,911; Commercial Gas Company (1031), £12,141; South Suburban Gas Company (498), £19,128; Newport (Mon.) Gas Company (300), £2000 to £3000; Chester Gas Company (67), £511. The system was introduced by the South Metropolitan Company in 1889, by the South Suburban Company (then the Crystal Palace District Gas Company) in 1894, by the Newport Company in 1900, and by the Commercial and Chester Companies in 1901.

MISCELLANEOUS NEWS.

THE COMMITTEE ON METROPOLITAN GAS TESTING.

Abstract of the Evidence.

In the number of the "JOURNAL" for July 26, a summary was given of the evidence adduced on May 2, which was the fifteenth day on which the Committee sat. The publication last week of the Blue-Book containing the whole of the evidence, with numerous appendices, enables us to complete our abstract with a report of the proceedings on the sixteenth day.

Subsequent to the fifteenth day's sitting, the following letter with reference to the evidence of Mr. C. Vernon Boys was sent by Mr. W. J. A. Butterfield, the Secretary to the Gas Referees, to the Secretary of the Committee.

Dear Sir,—Mr. C. V. Boys has directed me to say, with reference to the determinations of the calorific power of the gas supplied by the three Metropolitan Companies, of which he reported the results to the Committee on May 2, that the analyses of the samples of gas, which he took in each case immediately after the calorimetric testing had been made, had not been completed when he was called away from London at the end of last week. He therefore instructed me to report to you direct the results of these analyses, and the estimated proportion of carburetted water gas present in the samples. The proportion of carbon monoxide in the sample of gas taken at the Stoney Lane testing-place, is, as you will observe, somewhat higher than the average proportion in neat coal gas; but as there was presumably no admixture of carburetted water gas in this case, the figure obtained has been adopted in calculating the proportion of the admixture in the other two samples. That is to say, the proportion of carburetted water gas present is calculated on the assumption that the percentage of carbon monoxide in coal gas is 9, and in carburetted water gas 30.

Sample taken at . . .	1, Stoney Lane. (South Metropolitan Gas Company).	6, Wellclose Square. (Commercial Gas Company.)	Spring Gardens. (48-inch main.) (Gaslight and Coke Company.)
Sample taken on . . .	April 30.	April 30.	May 2.
Percentage (by volume) of carbon monoxide . .	9·01	13·99	11·13
Estimated percentage of carburetted water gas in the sample . . .	—	23·8	10·1

Sixteenth Day—Tuesday, May 10.

Mr. OTTO HEHNER, recalled.

Mr. Otto Hehner, on being recalled, handed in the following report on some further experiments undertaken on behalf of the South Metropolitan Gas Company, at the suggestion of the Committee, on the sulphur contamination of air by the combustion of coal gas.

The results of the experiments, given in the evidence before the Committee on March 15 ["JOURNAL," July 5, p. 52] showed that in an ordinary papered and whitewashed room the sulphur oxides thrown into the air by the combustion of a gas-flame were removed so rapidly that the proportion of sulphur in the air of the room was not materially greater, and even sometimes smaller, than the total sulphur content of the outside air. The Committee suggested that further experiments be made in a room not papered and whitewashed; and the present report contains the results of the experiments carried out in this and other directions.

The front room in the experimental cottage in which many of the previously reported experiments had been carried out, had its ceiling papered, and the walls and ceiling were then sized and varnished. It was put into as air-tight a condition as was practicable by these means. The back room—which had in the former experiments been as air-tight as its porous walls and ceilings would allow (the chimney and window having been puttied up)—on the other hand was put into a normal condition for a living room; the fire-place being opened and the putty removed from the windows. In the case of the front room, with a capacity of 917 cubic feet, the ventilation through the walls and ceilings, which—with the chimney and windows sealed—had formerly been between 500 and 780 cubic feet per hour, with an average of 654 cubic feet, was reduced by the varnishing to 124 to 182 cubic feet per hour. The air in this room, therefore, now changed by ventilation about once in six hours. It was not found possible to reduce the amount of air entering below this limit. In the case of the back room, under the new conditions of ventilation, 1220 cubic feet entered per hour, or, as the volume of the room is 774 cubic feet, the air changed nearly twice in an hour.

Fresh determinations were made of the amount of sulphur dioxide perceptible by the senses in a room charged with air containing carbonic acid; and the earlier results were confirmed. Known amounts of carbonic acid and sulphur dioxide were introduced into a room, and the whole well mixed. It was found from the observations of three persons, made independently, only one of whom knew the quantities present, that with five parts per million of sulphur dioxide, the taste and smell of the sulphur compound were recognizable; with four parts per million the smell was no longer distinguishable, but something could be tasted; with three parts per million nothing was apparent. In four of the experiments, to be detailed subsequently, larger quantities of sulphur dioxide than the lowest perceptible limit should have been theoretically present; but in no case could the taste or smell be observed, and the analysis of the air showed that the actual amount of sulphur compounds was far less than the theoretical.

For the quantitative determinations, precisely the same arrangement of apparatus was used as previously. As the conclusions arrived at depend largely upon the accuracy of the method of analysis, I once more state that three towers filled with glass beads were arranged in series; a dilute solution of distilled hydrogen peroxide (which was perfectly free from sulphur) being allowed to trickle downwards, the air passing in the reverse direction at a rate of about 5 cubic feet per hour. As a rule, the aspiration was continued during a full working day of eight hours, and the liquids and washings from each tower were analyzed separately. The amount of barium sulphate from the third tower was always *nil*; that from the second tower sometimes *nil*, and never exceeded 10 per cent. of that found in the first tower. Hence two towers only were employed throughout this second series of the experiments.

After the room was varnished, it became possible to carry out synthetic control experiments of the method of analysis. It is clear, however, that as long as a room is used which cannot be quite air-tight, the analytical control cannot be absolute, since the air—although it may be in small amount—which enters the room contains sulphur, and since, at the same time, a slight absorption of the sulphur compounds by the walls or condensation on the walls and windows must take place. These two effects tend in opposite directions.

CONTROL EXPERIMENT I.

19·37 cubic centimetres of pure dry sulphurous acid (sulphur dioxide), measured at 0°C. and 760 millimetres pressure, were introduced into the varnished room, and the air well mixed by a punkah; a sufficient amount of carbon dioxide from a cylinder of the compressed gas having been previously introduced, so that the ventilation during the progress of the experiment could be studied and allowed for. Seventy-one cubic feet of the air of the room were drawn through the towers; a double set of absorbers being used, and the experiment lasting eight hours. The amount of carbon dioxide at the beginning of the experiment was 110 volumes per 10,000; the average from hourly experiments taken during the whole time of absorption was found to be 69; while an average sample, taken by a mercury sampler, during the eight hours was 65. The 19·37 cubic centimetres of sulphur dioxide would have furnished theoretically a total amount of 203 milligrammes of barium sulphate. The sulphur dioxide contained in the 71 cubic feet of air aspirated, allowing for ventilation, should have yielded 9·3 milligrammes of barium sulphate. The actual amount of barium sulphate found was 9·6 milligrammes. In this experiment, owing to the length of time taken, the effect of the sulphur of the outside air just about balances the amount absorbed or condensed. In order to reduce this latter effect, if possible, the air of the room was mixed with a much larger proportion of sulphur dioxide, and a much smaller volume of air was passed through the towers in a very short time.

CONTROL EXPERIMENT II.

186·5 cubic centimetres of sulphur dioxide were introduced into the room, the air of which contained 52 parts per 10,000 of carbon dioxide. The air was thoroughly mixed. During a single hour, 8·43 cubic feet of the mixture were drawn through one set of towers. Allowing for ventilation during the experiment, 14·8 milligrammes of barium sulphate should have been obtained from the 8·43 cubic feet of air. There were actually obtained 11·1 milligrammes, or 75 per cent. of the theoretical amount. The rapidity of the passage of the air through the absorbing towers was exceptionally high; hence probably the low yield.

I am satisfied, from the results above detailed, that the method of analysis does give, with a sufficient amount of accuracy, the actual quantity of the sulphur present in the air. Even assuming that only 75 per cent. was obtained, the general conclusions previously given in evidence would be in no way affected.

EXPERIMENTS CONCERNING THE CONTAMINATION OF THE AIR OF THE VARNISHED ROOM BY COMBUSTION OF COAL GAS.

Experiment A.—23 cubic feet of gas, containing 35·1 grains of sulphur per 100 cubic feet, were burnt. 1 cubic foot of gas furnished 0·53 cubic foot of carbon dioxide. Two absorbing towers used. Blank experiment with hydrogen peroxide—no trace of sulphur. Air drawn through towers, 36·0 cubic feet. Duration of experiment, 5 hours. Average carbon dioxide, 45 per 10,000. Total sulphur theoretically present in 36 cubic feet of the air, 43·1 milligrammes barium sulphate. Barium sulphate actually obtained, 5·6 milligrammes. Ratio, 0·13 (one-eighth). Air of room, 0·55 sulphur dioxide per 1,000,000. Outside air aspirated, 56 cubic feet. Barium sulphate obtained, 7·5 milligrammes; equal to 0·47 sulphur dioxide per 1,000,000.

Experiment B.—17 cubic feet of gas, with 35·3 grains of sulphur per 100 cubic feet, were burnt. 1 cubic foot of gas gave 0·52 cubic foot carbon dioxide. Air drawn through towers, 48 cubic feet. Carbon dioxide at start, 8; maximum, 70; average, 65·5 per 10,000. Duration of experiment, 5½ hours. Barium sulphate expected in 48 cubic feet, 89·5 milligrammes; actual amount obtained, 5 milligrammes. Ratio, 0·056 (one-eighteenth). Sulphur content of the air, 0·38 sulphur dioxde per 1,000,000. There was a large amount of condensation on the walls and windows. Outside air aspirated, 40 cubic feet. Barium sulphate obtained, 4·3 milligrammes; equal to 0·38 sulphur dioxide per 1,000,000.

Experiment C.—3·5 cubic feet of gas, with 37·8 grains of sulphur per 100 cubic feet, were burnt. 1 cubic foot of gas gave 0·52 cubic foot carbon dioxide. Air drawn through towers, 22·5 cubic feet. Carbon dioxide at start, 6; 26·5 maximum; average, 22 per 10,000. Duration of test, 7 hours. Barium sulphate expected, 12·4 milligrammes; barium sulphate obtained, 0·9 milligramme. Ratio, 0·072 (one-fourteenth). Sulphur content of air, 0·14 sulphur dioxide per 1,000,000. Outside air

aspirated, 46 cubic feet. Barium sulphate obtained, 7·1 milligrammes; equal to 0·54 sulphur dioxide per 1,000,000.

Experiment D.—7·5 cubic feet of gas, with 27·3 grains of sulphur per 100 cubic feet, were burnt. 1 cubic foot of gas gave 0·50 cubic foot of carbon dioxide. Air drawn through towers, 22·5 cubic feet. Carbon dioxide at start, 23; maximum, 49; average, 45 per 10,000. Duration of absorption, 7½ hours. At conclusion of experiments, slight fog in room; walls moist. Barium sulphate expected, 28·9 milligrammes; barium sulphate obtained, 4 milligrammes. Ratio, 0·138 (one-seventh). Sulphur content of air, 0·63 sulphur dioxide per 1,000,000. Outside air aspirated, 34·5 cubic feet. Barium sulphate obtained, 2·9 milligrammes; equal to 0·29 sulphide dioxide per 1,000,000.

Experiment E.—35 cubic feet gas burnt, with 25·4 grains of sulphur per 100 cubic feet. 1 cubic foot gas gave 0·487 cubic foot carbon dioxide. Air drawn through towers, 28 cubic feet. Carbon dioxide at start, 7; maximum, about 140; average, 80. Duration of absorption, 8 hours. Barium sulphate expected, 55·3 milligrammes; actual amount obtained, 4 milligrammes. Ratio, 0·0726 (one-fourteenth). Sulphur contents of the air, 0·50 sulphur dioxide per 1,000,000. At the conclusion of the experiment, there was a heavy fog in the room; and the walls were streaming with condensation. Outside air aspirated, 48 cubic feet. Barium sulphate obtained, 5 milligrammes; equal to 0·37 sulphur dioxide per 1,000,000.

EXPERIMENTS CONCERNING THE CONTAMINATION OF THE AIR OF THE ORDINARY NON-VARNISHED ROOM BY COMBUSTION OF COAL GAS.

Experiment F.—40 cubic feet gas burnt, with 30·1 grains sulphur per 100 cubic feet. 1 cubic foot of gas gave 0·454 cubic foot carbon dioxide. Air drawn through towers, 46 cubic feet. Duration of experiment, 8 hours. Carbon dioxide at start, 17; maximum, 33; average, 22 per 10,000. Barium sulphate expected, 31·8 milligrammes; actual amount obtained, 5·7 milligrammes. Ratio 0·18 (one sixth). There was no fog at the conclusion of the experiment; and the walls were dry. Outside air aspirated, 46·5 cubic feet. Barium sulphate obtained, 3·4 milligrammes. Sulphur content of air of room, 0·44 of outside air; 0·26 sulphur dioxide per 1,000,000.

Experiment G.—43 cubic feet of gas, with 27·5 grains sulphur per 100 cubic feet, were burnt. 1 cubic foot gave gas, 0·479 cubic foot carbon dioxide. Air drawn through towers, 47 cubic feet. Duration of absorption, 8 hours. Carbon dioxide at start, 12; maximum, 26; average, 21 per 10,000. Barium sulphate expected, 26·8 milligrammes; actual amount obtained, 6·5 milligrammes. Ratio 0·24 (one-fourth). Sulphur contents of the air, 0·49 sulphur dioxide per 1,000,000. No fog or condensation at the end of the experiment. Outside air aspirated, 59 cubic feet. Barium sulphate obtained, 6·4 milligrammes; equal to 0·38 sulphur dioxide per 1,000,000.

I am perfectly satisfied from these experiments that, even in a comparatively air-tight room with non-absorbent walls, it is impossible to increase the sulphur content of the air materially beyond the sulphur content of the outside air. Sulphur acids are clearly thrown into the air of the room by the combustion of coal gas; but they are removed as soon as formed. The removal of the sulphur compounds appears to be effected in three ways.

(1) *By Ventilation.*—In rooms under ordinary conditions, this would be the largest factor. The effects of ventilation have in my experiments been deducted and allowed for throughout—a point which should be clearly borne in mind, as the experiments have been more especially directed to discovering the other means of elimination.

(2) *By the Alkaline Materials of the Walls and Ceilings.*—Here the effects have proved to be greater than was originally expected. The amount of absorption would probably be proportional to the amount of absorbable compounds of sulphur present; hence the effect is greater where ventilation is less. It has thus the effect of working automatically with increased effect when the natural ventilation is interfered with. In the case where the ventilation is reduced to the smallest possible amount, a slight absorption by the walls and ceilings still appears to take place; but the chief removal is then by

(3) *Condensation.*—Not only is the amount of water condensed palpably greater, but the actual amount of acid carried down by the liquid is increased, as is strikingly shown by the fact that the water condensed on the windows of the well-ventilated room is not appreciably acid to litmus paper; while that condensed on the windows of the varnished room is distinctly acid.

Questioned by the Chairman, witness pointed out that he had previously reported that five parts per million of sulphur dioxide could be perceived. More careful experiments, however, had led to the conclusion that five parts could be both tasted and smelt; while four parts could not be smelt, but could be perceived. The conclusion that he arrived at from the tests detailed in the above report was that, though by combustion of impure gas a certain amount of sulphur was brought into the air, this sulphur did not remain in the air, but was removed as fast as it formed, whether the room were whitewashed or varnished. It was, he believed, removed by absorption condensation. By the combustion of gas, water vapour was produced, which condensed in an air-tight room; and this helped to carry away the sulphur. The amount of sulphur present in the air as breathed did not become materially larger by gas combustion. It became condensed into a form in which it was no longer injurious to comfort or to health.

In answer to Dr. Farquharson, witness said there was not a particle of evidence to show that sulphur products which were not perceptible to the senses might still be injurious to human beings in a room. In fact, he did not know of any evidence whatever that sulphur dioxide, even when it could be smelt, was injurious to man. Asked whether he had formed any opinion as to the possibly beneficial effects of sulphur in the air as an antiseptic, he replied that if he let the condensation (which was acid) trickle over any alkaline material containing bacteria, it must be injurious to the bacteria; and therefore it might be said that it was an antiseptic. It was, however, too far-fetched to rely on gas-vitiated air as an antiseptic. He did not think air ought to have such chemical properties as to be able to act as an antiseptic; the room should be so well ventilated that the sulphur dioxide could not act in this way.

In conclusion, Mr. Hehner asked permission to allude to some criticisms by Dr. Haldane upon the references made by himself and Dr. Rideal to the report of the Departmental Committee on the Ventilation of Factories and Workshops. Dr. Rideal said that their allusions to this report were incorrect, and that the actual recommendation of the Committee with regard to factories lit by gas was that the ventilation should be such that the proportion of carbonic acid in the air did not exceed 20 volumes per 10,000. Their statement was that the Committee limited the amount of carbon dioxide brought into the room by combustion to 8 volumes. Dr. Haldane said this was untrue. He (Mr. Hehner) could, however, refer the Committee to Recommendation No. 1 in the report, which was as follows: "That in exercise of the powers conferred on the Secretary of State, by section 7 of the Factory Act of 1901, such a standard of ventilation should be prescribed for all classes of factories and workshops not otherwise specially dealt with, that the proportion of carbonic acid in the air at about the breathing level, and away from the immediate influence of any special source of contamination, such as a person or light, shall not (except on very foggy days, when no tests should be made, on account of the vitiated state of the outside air) rise during daylight, or after dark when only electric light is used, beyond 12 volumes of carbonic acid per 10,000 of air; and that when gas or oil is used for lighting, the proportion shall not exceed 20 volumes after dark or before the first hour of daylight." That was to say, men and machinery might pollute the air up to 12 volumes; and when gas was lit (under certain circumstances) the carbon dioxide was not to exceed 20 volumes, while when electricity was employed there must not be more than 12 volumes day and night. If this meant anything whatever, it was that by the combustion of gas 8 volumes of carbonic acid might be produced, and no more—namely, the difference between 20 and 12 volumes.

Sir GEORGE LIVESEY, recalled.

The following supplementary proof was handed in by Sir George Livesey, in reply to the evidence of the London County Council.

Witness thinks it scarcely necessary to trouble the Committee with any reply to the evidence of Dr. Frankland and Messrs. Bellamy and Carr. Referring to Mr. Haward's evidence, witness, as author of the sliding-scale, would like to explain how it originated, and his object in suggesting it in his address as President of the British Association of Gas Managers in 1874, and its adoption by the Metropolitan Board of Works and the Board of Trade in 1875. As to Mr. Haward's reference to high gas dividends, the last issue of 10 per cent. stock at par to the shareholders was £250,000 in 1869. Very few of the allottees are now living. The nominal dividend of the South Metropolitan stock is now £5 6s. 8d. per cent.; but allowing for the premium at which the auction clause stock was purchased, the yield to the purchaser is under 4½ per cent. Witness agrees with Mr. Haward that the entire saving from any reduction of illuminating power should go to the consumers, because the fixing of the illuminating power was part of the parliamentary bargain. Any small saving from the abolition of lime purification is in a totally different category; for the prescription was the act of the Referees, and they could repeal it. Oxide costs less than lime, and about two-thirds of the original cost is returned by the sulphur in the spent oxide; but the labour of purification is about the same, and the 0·4 candle reduced illuminating power is also a set-off. Witness adheres to his statement that the reason why the illuminating power of the Gaslight and Coke Company was not reduced, was the fact that the Company would not give up 1d. per candle of their initial price; it being agreed generally that at most only ½d. would be saved. The following statement shows exactly the saving so far effected by the South Metropolitan Company by the reduction of illuminating power.

Cost of Enrichment.

South Metropolitan Gas.—Standard: 16 candles to June 30, 1901, then 14 candles; but the actual illuminating power could only be reduced at that time by stopping enrichment, and afterwards gradually by increasing the yield of gas per ton of coal.

During the three years prior to the change, the average cost of spirit enrichment was 0·414d. per 1000 feet sold; the gas sold being 9418 feet per ton.

Saving by Abolition of Enrichment.—During the first twelve months after the change, the saving by the abolition of enrichment on 11,252,112,000 cubic feet, at 0·414d. per 1000 feet, was	£19,410
Saving by Increasing the Yield of Gas per Ton.—The gas sold increased only 92 feet per ton, saving 11,644 tons of coal at net cost, *plus* wages	£3,747
Total	£23,157
But the 2d. reduction of price (1d. per candle) amounted to	93,768
Of which only one-fourth was saved by the Company.	
During the last twelve months (year 1903), enrichment saved was on 11,582,286,000 cubic feet sold, at 0·414d. per 1000 feet	£19,978
The gas sold was 10,156 feet per ton, an increase of 738 feet, saving 89,164 tons of coal, costing	18,948
Total	£38,926
The 2d. reduction of price (1d. per candle).	£96,518

The saving of £38,926 so far, therefore, is considerably under ½d. per candle.

DR. CLOWES'S EVIDENCE—METHOD OF TESTING.

Witness agrees with Dr. Clowes that the standard 16-candle burner should be retained for as wide a range of illuminating power as possible, but cannot believe it to be necessary to waste the time of the Committee to contest the impossibility and absurdity of Dr. Clowes's contention that the 5 feet rate of consumption should be retained for all qualities of gas. The consumer does not burn his gas at the 5 feet rate. If the 5 feet an hour rate is to be retained, a different burner must be prescribed for every variation of illuminating power. This would be better for the gas. Notwithstanding all the assertions to the

contrary that have been made to the Committee by various witnesses, gas which gives 16 candles in the standard burner when burning 5·7 feet per hour, is not 13 but 14 candle gas. So far as the South Metropolitan Company are concerned, Parliament has settled this question; and speaking for the Commercial Company, it would be a great injustice to that Company to test their gas differently to the South Metropolitan. The Commercial Company gave up 2d. of their initial price for the 2-candle reduction, following the South Metropolitan; and to require them now to supply 15-candle gas and call it 14 is an act that cannot be contemplated by any other body than the London County Council.

PORTABLE PHOTOMETER.

This question had a very full hearing before Mr. Oldroyd's Committee in 1900, when the London County Council brought in a Bill to legalize the instrument and to penalize the Gas Companies on its results. The Council's case was put first, and appeared to impress the Committee; but on the other side being heard, the Council's case collapsed, and their Bill was rejected. The portable photometer violates the principle on which Parliament has always acted in regard to the testing of gas. It is the universal practice to test gas by taking it from large or leading mains—samples of "live gas" from bulk, and not what may very often be "dead gas" from the small mains or pipes. From the time of Dr. Letheby, in 1860, it has been known to Parliament that gas often loses some of its illuminating power by travelling through the pipes. This is why a distance of 1000 yards was prescribed in the Act of 1860, to share the loss by travelling between the Company and the consumer. Mr. Bellamy stated that gas will drop certain hydrocarbons one day, and pick them up on another. The departure from the 1000 yards principle was necessitated by the establishment of Beckton; but the Referees have always selected positions for the London testing-places on large or leading mains. Had Parliament intended the consumers all over the districts of the London Gas Companies to have 16-candle gas, it must have prescribed at least 17 candles at the regulation testing-stations.

Witness proved from Dr. Clowes's statements before Mr. Oldroyd's Committee that in cases where it was impossible that there could be any difference in the gas, the portable photometer gave a much lower return than that obtained in the testing-place in the next street—this was at Burrage Road, Plumstead. Dr. Clowes stated that up to 1890 there was no great discrepancy between the portable photometer and the regular testing-stations, but that after that date the discrepancies became serious. Up to 1890, the only method of enrichment was by the sure and certain means of an admixture of cannel, which, however, was becoming more scarce and dear, year by year, until the cost of enrichment reached 2d. per candle. Then other methods came into use—viz., one by an admixture of a highly volatile petroleum spirit, afterwards known as carburine, and by benzol; the vapour being passed into the gas as it leaves the works, and never anywhere in the district mains. Experiments showed this system to be reliable; but experience cast doubts on this conclusion, at least under some conditions. This led witness to suggest a trial for a fortnight of unenriched gas. The London County Council assented; and spirit enrichment was found to be of little if any advantage to the consumers. It was right enough for the large mains; but in out-of-the-way places, and away from the active flow of gas, there was but little difference in the illuminating power of enriched and unenriched gas. This first led witness to doubt the wisdom of all enrichment, and led him to formulate the axiom that the proper quality of gas for any place was that which could be obtained from the available supply of coal without any enrichment. Therefore the other method of enrichment—carburetted water gas—was not adopted; and the Company continued spirit enrichment as the only practical and temporary method of complying with their parliamentary requirements.

At the first opportunity—viz., in 1900, the session after Sir James Rankin's Committee reported—the Company introduced a Bill adopting the recommendations of that Committee, and applying for a reduction of illuminating power. We did not make the attempt sooner, because we thought there would be no chance of success, knowing how the London County Council oppose everything. They appear to believe that any proposal of a gas company must be against the interest of the consumers; they do not understand the partnership of the sliding-scale.

Witness is only confirmed, by all that passes, in the conviction that all enrichment is a mistake, and will now turn to carburetted water gas, and give his reasons why the South Metropolitan did not adopt it. In the first place, it did not appear to be economically advisable. So far as we could calculate, it would be more costly than coal gas. Coal was very cheap at the time, and oil was dearer than it is now. At the Crystal Palace District Gas Company, their inland position adds about 2s. 3d. to 2s. 6d. per ton to the price of coal; and as the Engineer was anxious to erect a water-gas plant, the Board consented. One reason that influenced witness was to see the system tried. Comparing gas of equal illuminating power, water gas at Sydenham seems as cheap to make as coal gas, and for purposes of enrichment the Engineer has furnished a statement that it costs barely ½d. per candle, without taking into the calculation the enhanced value of coke, which is undoubted, but very difficult to estimate. Witness's experience at Sydenham has shown that the serious objection to carburetted water gas is its interference with the economical and satisfactory use of gas-stoves and gas-fires. It requires less air for its combustion than coal gas, and therefore upsets all the bunsen burners—causing serious dissatisfaction with gas-stoves and gas-fires. The Company, therefore, in 1903, and again this year, promoted Bills to relieve them from the necessity for enrichment. Last year the Bill triumphantly passed the Commons; but the London County Council persuaded the Lords Committee to make the Company wait for the report of the Board of Trade Committee. This year the London County Council and other local authorities have induced the Board of Trade to require the elimination of all controversial matter from the Bill—viz., the reduction of illuminating power and the abolition of lime, which causes a great nuisance to the neighbourhood.

The resources of civilization are all but exhausted. The great question is whether the illuminating power should be reduced or not. Should it stop with the abolition of enrichment, or go on step by step? Theorizing is no use. Practical experience in ordinary working alone can prove the point. There are two Companies willing and anxious to make the experiment. I ask that the opportunity be given. A statement has been prepared for the Committee proving that the reduction of illuminating power by the South Metropolitan Company has caused no increase of consumption. Dr. Clowes says the incandescent burner gives more light than the consumer wants. That being so, and get the flat flame displaced by the incandescent, the difficulty as to the reduction of illuminating power of lighting gas is solved.

Attention is drawn to Dr. Clowes's statement, that the suggestion of Mr. Harcourt to limit sulphuretted hydrogen to 1 grain in 100 feet, or 1 part in 63,500, is a "very large" quantity. Sulphuretted hydrogen that will readily stain lead paper at (say) 9 o'clock in the morning, would, even if pure gas has passed through the pipes during the remainder of the day, show a stain at 9 o'clock at night, from the simple contamination of the pipes.

Witness was asked by Mr. Moulton whether he saw any objection from the side of the Gas Companies to the details of the sliding-scale being changed, so that, taking it, for instance, as being equally unfavourable to both parties at the present moment, the share of the Gas Companies in any economy, and in the burden of any increase of cost, should be larger. He replied that he did not. It was larger at the start—three to one, whereas now it was six to one. At present, as Mr. Haward put it, the increment of dividend under the sliding-scale was almost too small to be a sufficient incentive to economy. Sir James Rankin's Committee reduced the initial price, but increased the increment of dividend as compensation for the reduction. The suggestion, however, did not go far enough.

As to the method of testing, witness remarked that if 14-candle gas was tested at the 5 feet an hour rate, it was unfair to the gas; and if, as he hoped, the quality of gas was going lower, it would be utterly impossible to test 12-candle gas in the 16-candle burner at this rate—it would only show it as equal to about 8 or 9 candles. His objection was that it was not the proper way to burn the gas, and it was certainly not the way the consumer would burn it.

Witness next alluded to a statement made by Mr. Vernon Harcourt, that he (Sir George) had taken up the position that all the Act called upon the Company to do was to provide gas of a certain quality at the testing-places. Mr. Vernon Harcourt added that it appeared to him a very singular supposition that the testing-places should exist only for the sake of having good gas supplied to them. This, however, was not quite the way to put it. The late Dr. Letheby, who undertook the first official gas test in the Metropolis, was the Medical Officer to the London Hospital. He had a testing-place in the City, and one at the hospital; and he used also to test the gas at the works. At the works, he found the gas of a certain quality (it might be mixed with a little cannel, but speaking generally it was coal gas exclusively), at the hospital a little lower, and in the City rather lower still. The Gas Act of 1860, based on the evidence of Dr. Letheby, fixed the testing-place at 1000 yards, as near as might be, from the works. Then Beckton came in, and altered the position; and in 1876, the South Metropolitan Company's Act and the Gaslight and Coke Company's Act dropped the 1000 yards limit. In all other cases, however, Parliament had prescribed that the gas should be tested within a mile, or 1000 yards, of the works, or at the works or the town hall; and it had always to be tested in bulk—never in out-of-the-way places in the district. It might be assumed from this that it was well known to Parliament that gas did lose in travelling. Therefore, in fixing 16 candles tested at 1000 yards from the works or on a leading main, this did not mean that 16 candles were to be supplied to everybody throughout the district. If the Companies were to supply 16 candles throughout their area, then Parliament would have had to have said that about 17 or 17½ candles should be the standard at the testing-place, in order to be safe. If, therefore, the portable photometer were in use, the Companies would have to increase the quality of their gas, and the public would have to pay for it. Notwithstanding what was said to the contrary, naphthalene did reduce the illuminating power. When the whole surface of a service-pipe was coated with naphthalene, his Company had found a candle difference on cleaning it out. He did not object to the Referees or other authority having the power to fix the testing-place where they thought proper, provided the gas was tested in bulk off a leading main. The South Metropolitan Company now found it impossible to get down to 12-candle gas; so that when the portable photometer gave a result of 11 candles, the fault must have been in the testing.

On the subject of water-gas enrichment, witness said this had been considered by the South Metropolitan Company; and in the early days a plant—which as it happened was not the best—was put up. It, however, caused so much nuisance to the people in the neighbourhood that they could not use it. Then a plant was fitted up at the Crystal Palace Gas Company's works; but it had caused them an immense amount of trouble. They were at the moment being prosecuted for some nuisance through the tar, he believed it was, escaping into a brook; and there was a great deal of complaint from the neighbourhood, as to the smell of the burning oil, and so on. But the most serious objection was its interference with gas cooking-stoves, which were constantly lighting-back. It would be feasible to make a stove that would suit the enriched gas, if the enrichment was constant and uniform; if it varied, the bunsen burner would have to be adjusted every time. In many cases water gas had been adopted as a check on the price of cannel; and this was one of the best reasons for using it. In other instances it was installed because it gave such command over the men, though this was a consideration that did not influence the South Metropolitan or Crystal Palace Company. For his part, he said get rid of all the bother, and have simple coal gas. If they could get a perfectly constant mixture of coal and water gas, and the burners were all adapted to it, he would have nothing to say; but it would be very difficult to do this, in view of the temptation of being able to deal with a varying supply. It was, of course, true that many companies and corporations had adopted carburetted water gas, and given repeat orders for plant; but as far as the South Metropolitan Company were

concerned, he could not see that the financial results were such as to justify the adoption of the system. Some of the undertakings, he thought, did not charge enough for the water gas, or else charged too much for the coal gas—for repairs.

Witness said Mr. Moulton had asked him for the figures of the slot-meter consumers, to show that there had not been an increase in consumption from the reduction of illuminating power. The following figures gave the average consumption per slot meter, quarter by quarter, since 1897. The alteration in illuminating power was made from June, 1901; and then the Company began to change the burners. The consumption per slot meter in 1901 (that was, the twelve months prior to Lady-day) was 18,209 cubic feet; Midsummer, 18,552 feet; Michaelmas, 18,606 feet; and Christmas, 18,666 feet. Then it gradually went down to 17,975 feet, which he thought proved conclusively that the alteration in the illuminating power did not cause any increase in the consumption.

Dr. Clowes, he went on to say, took the gas-rental of the three Companies in 1900 and 1902, and made a comparison. But the price of gas had varied immensely during that time; and so this was no fair comparison. Besides, it was not fair to take the Gaslight and Coke Company, with a business that had been diminishing for a number of years, and compare it with the South Metropolitan, which had been increasing. He (witness) compared the South Metropolitan with the South Metropolitan and with the Crystal Palace District Gas Company. In the six half years prior to June, 1901, the average increase was 5·6 per cent.; whereas in the five half years afterwards, it was only 3·4 per cent. Now, if the statement made that the consumers must burn 30 per cent. more gas to get the same amount of light were true, surely there would not have been a reduction of the increase in the consumption of gas, when the increase of business was going on at a greater rate than before. The average increase of consumers in the six half years prior to June, 1901, was 14,650; while in the next three years it was 16,988. In the case of the Crystal Palace Company, the increase in the six half years prior to June, 1901, was 5·4 per cent. on the average, against the 5·6 per cent. of the South Metropolitan; while in the following five half years they had an increase of 2·7 per cent., as compared with the 3·4 per cent. of the South Metropolitan. Both Companies started canvassing and the maintenance of mantles in the latter half of 1902. He thought this was concluslve evidence that the reduction of illuminating power did not cause any increase of consumption.

With regard to testing for pressure, this was absolutely useless. The Companies never sent out the gas at less than the proper pressure. It was always greatly more; and if in any house there was insufficient pressure, it was certainly due entirely to a local defect. Testing for ammonia was also useless. There was in the whole country very little testing for ammonia; and no company ever sent out a quantity in excess of the limit allowed. The Chairman remarked that he thought it was agreed this was so.

Witness then asked: "Are we to go on making an experiment in the direction of low-quality gas or not?" He pointed out that so far as the light was concerned, Dr. Clowes had said that the mantle gave more light than the consumer wanted. Sir George therefore argued that, if the mantle could displace the flat-flame burner, the question of illuminating power became of no importance. They hoped and believed this would come about here, as it had done in Germany. Theorizing, he added, was of no use. Practical experience in ordinary work alone could prove whether low-quality gas was the right thing. At present, they could not make the experiment. Mr. Duckham, of Bournemouth, had, however, told him that by a certain method of making gas they had obtained 18,000 or 19,000 cubic feet of 8-candle gas per ton of coal, by continuous carbonizing in a vertical retort. Now, if they could do this, a great thing would be accomplished for the supply of fuel gas.

Mr. G. C. Trewby recalled.

The following observations were handed in by Mr. Trewby, on the evidence given as affecting the Gaslight and Coke Company.

The Gaslight and Coke Company consider that certain evidence which has been give before the Committee would leave the impression that, by adhering to the manufacture and supply of 16-candle gas, they have not been studying their own interest nor that of the consumers. I allude more particularly to the statement which was put in by Mr. H. E. Jones, the purport of which was an endeavour to show that all those Companies who have adopted the 14-candle gas have accomplished an important reduction in the price. As a matter of fact, taking the Companies both inside and outside London (as shown by the accompanying statement), the reduction in price is mainly due to the large comparative increase in the quantity of gas sold, by reason of which the capital charges are lessened and the cost of working also. Coming to the London Gas Companies, it would appear from Mr. Jones's statement that he would try and make the Committee believe that the decrease in the price of gas between 1881 and 1903, as far as the Commercial and South Metropolitan Companies are concerned, has arisen from the fact that they are now supplying 14-candle gas. Whereas it will be seen from the statement that the price of gas in 1899, when each of the three Companies supplied 16-candle gas, is exactly the same as the present price, when the Gaslight and Coke Company supply 16-candle and the other Companies 14. Therefore there is not the slightest ground for assuming that the reduction in illuminating power has had any effect whatever up to the present time in reducing the price of gas charged to the consumer.

Dr. Clowes's evidence.

Dr. Clowes states that the increase of light as between 1860 and to-day has been obtained by improvements in standard burners, and not by any improved quality of the gas. Apart from any other reason, we know that the photometers now used give a lower illuminating power to the gas tested in them by fully 1 candle than the Evans photometer formerly used. Dr. Clowes states that the standard burner was favourably received by the Gas Companies, and that the 5 feet rate should be retained. It is true the burner was favourably received by the Companies at the time of its adoption, as it then, with a consumption in it of 5 cubic feet per hour, fulfilled the conditions laid down by Parliament, that it should develop the greatest amount of light, and be practicable for use by the consumer. The former condition the burner no longer complies with as used, as the introduction of water gas has completely altered the conditions under which a 5 feet per hour flame is burned in it. The flame is shorter, due to the larger amount of carbonic oxide; and bulk for bulk a smaller quantity of air is required for its combustion. The flame is over-oxidized, and the gas is prejudicially affected. The objections hold good as regards burning the gas at a 16-candle flame, which system is now officially prescribed; the Company losing to the extent of over 1 candle. The Company, therefore—due to the method of testing prescribed, and allowing a small margin for errors in testing and loss—are compelled in some cases to extend their obligations of illuminating power to the extent of sending out what really should be denominated 17½-candle gas in place of 16-candle prescribed.

re Mr. H. E. Jones's evidence.

Company.	Gas Sold Increase per Cent. — 1903 over 1881.	Price Charged. 1881.	Price Charged. 1903.	Price Charged. Reduction per Cent.	Illuminating Power Prescribed. 1881.	Illuminating Power Prescribed. 1903.
	Per Cent.			Per Cent.		
Eastbourne .	*307	4/4	*2/10	34·6	14	14
Wandsworth .	369	3/6	2/4	33·3	14	14
Watford . .	*388	4/-	*3/-	25·0	14	15
Margate . .	*278	3/6	*2/6	28·6	14	15
Epsom . . .	*158	4/9	*3/9	21·1	14	14
Metropolitan—Gaslight . .	50	3/2	3/-	5·3	16	16
Commercial .	88	3/-	2/6	†16·7	16	14 (From Jan. 1, 1903)
South Metropolitan . .	201	2/10	2/3	†20·6	16	14 (From July 1, 1901.
			1904 2/1	26·4		

* Figures for 1903 not available, those for 1902 have therefore been used.
† Taking 1899 (normal year prior to reduction in illuminating power), over 1881:—

	1881.	1899.		Reduction.
Gaslight	3/2	3/-		5·3 per cent.
Commercial.	3/-	2/6		16·7 ,,
South Metropolitan .	2/10	‡2/1	(December, ½-year)	26·4 ,,

Showing that on ordinary working the Commercial and South Metropolitan Companies had reduced prices to the present charge *before* any alteration was made in illuminating power.
‡ June half year was 2s. 2d.

The system of testing suggested by me is the only one which will be fair to the three Companies, and which can be uniformly applicable to testing the gas made under varying modes of manufacture, and consequently varying in the relative proportion of their constituents, and which, in the interests of the public, may be introduced as tending to economize the cost of production and the price to the consumers.

Testing Gas for Illuminating Power.

Mr. Carpenter strongly advocates the burning of the South Metropolitan gas at a 16-candle luminosity in the standard burner. In other words, burning the South Metropolitan 14-candle gas at a rate approximating to 5·71 cubic feet—that is, at such a rate that 14-candle coal gas will be burned at its approximately best efficiency in the standard burner. The Gaslight and Coke Company claim that their gas should also be tested on the same system of burning it to its best advantage—that is to say, at a height of flame not less than 3 nor more than 3½ inches, which will be given by burning it at a rate the same as proposed for the South Metropolitan gas—viz., about 5·7 cubic feet per hour. To test the gas now made by the South Metropolitan Company and that made by the Gaslight and Coke Company on the basis of the maintenance of a 16-candle flame in the standard burner, is to test the gases under totally different conditions, inasmuch as the South Metropolitan gas would be developing practically its full efficiency in the standard burner, while the Gaslight and Coke Company's gas would not be developing the efficiency that could be attained in the standard burner by fully 1 candle.

The reduction of 1 candle in the definition of the illuminating power of the gas, now contested by Mr. Carpenter, which would be the result on the South Metropolitan gas of testing it at 14 candles, would be transferred to the Gaslight and Coke Company's gas were the present system of testing both gases at 16 candles continued. Or, to put the matter briefly, the injustice the South Metropolitan Company resent in the proposals for testing would be transferred to an equal extent from their shoulders to those of the Gaslight and Coke Company.

Sulphur Compounds and Sulphuretted Hydrogen.

Dr. Clowes argues that the small number of cases of excessive impurity is evidence of the ease with which these impurities can be kept down to the statutory limit. The Engineers of the Company know that even the incessant care and attention which are constantly exercised fail at times to ensure the necessary degree of purity; and it is only by an excessive part of their time being devoted to this object, that the good record of the Company has been maintained. Mr. Carr (repeatedly referred to by Dr. Clowes as the Council's technical witness) states that "sulphur compounds are very erratic" and that they are "unstable compounds—difficult to deal with." Dr. Clowes, in his examination, refers to Mr. Holgate's process of purification as one dealing with "sulphur compounds" and its being a process which will do away with lime for sulphur purification. The process referred to is for the *partial* removal of carbonic acid and sulphuretted hydrogen.

It is not here put forward as dealing with "sulphur compounds;" and in recently bringing the process forward before us, Mr. Holgate has never once referred to sulphur compounds in connection with its adoption.

That the sulphuretted hydrogen test outside London is more severe than that of London, is a fallacy that will not hold good in the light of examination. The test outside London is a 3-minute test on a quantity of gas not exceeding ½ cubic foot in all; and the gas does not impinge on the test-papers. The London test extends over 15 hours, and is on 10 feet of gas; while each paper is opposite a fine jet which concentrates any indication of impurity in a spot easily visible, whereas the same amount of impurity diffused over the paper would not be visible as a stain.

Sulphur Effect on Leather.

With regard to Dr. Clowes, Dr. Haldane, and other witnesses's remarks as to the effect of sulphur compounds on leather, I would point out that where valuable books are kept, illumination would be effected by means of electric lights or by incandescent gas-lights, certainly not by the old flat-flame burners. The sulphur, therefore, would be considerably less than heretofore, even though the quantity per 100 cubic feet were increased. Heating such rooms by gas would not affect books, though increased sulphur were present in the gas, as the products of combustion would be, of course, carried by the ordinary flues into the outside atmosphere. The constant reference by Dr. Clowes to his "daily milk" as compared with gas, is beside the question as a parallel argument. Gas is supplied for the purpose of giving light, heat, or power; and so long as its illuminating power and calorific power are sufficient, the consumer is given his money's worth in gas, whether it contains a grain more or less sulphuretted hydrogen. The adulteration of food is an absolutely impossible parallel.

OBSERVATIONS ON TESTING.

The comparisons which are ever being made between the working of the Metropolitan Companies, make it exceedingly desirable that determinations of illuminating power should be made under conditions equally favourable. For this reason, the maintenance of a flame of a given length in the standard burner is suggested as being better than either burning at a fixed rate or at a predetermined luminosity. If the present South Metropolitan gas is burned in the standard burner at the 5 feet rate, as has been suggested, what now passes as 14-candle gas will be styled 13 candle gas only. This difference will be slightly exaggerated in the case of the Commercial Company, by reason of the admixture of water gas. The Gaslight and Coke Company's gas will undergo no change in its denomination. There would, therefore, be an actual difference of 3 candles between the nominal 14 and 16 candle gas supplied by the three Companies.

If, instead of an equal rate of consumption, the maintenance of a 16-candle flame is observed in the standard burner, a rate of burning is attained in the case of coal gas alone which approximately develops the maximum efficiency of the gas consumed in the standard burner. The rate of consumption for 14-candle coal gas will be slightly over 5·7 cubic feet per hour. This condition of burning will not be present in the standard burner when the mixture of coal and carburetted water gas made by the Gaslight and Coke Company is consumed in such a manner as to maintain a 16-candle flame. The flame will be considerably shorter than the coal-gas flame, and the excess of air passed over it will prejudice the result. To develop approximately the best efficiency will here, as in the case of the South Metropoltan gas, require a consumption of slightly over 5·7 cubic feet per hour, and will show that what is now denominated 16-candle gas should in the case of the Gaslight and Coke Company be styled rather over 17 candles.

Our contention is that the condition laid down by Parliament, of developing the greatest amount of light in the standard burner, should be observed. If the 5-feet rate is maintained, 14-candle gas suffers to the extent of a candle as compared with 16-candle gas. If the 16-candle flame be maintained, the South Metropolitan Company's gas will be burned in such a manner as will practically develop its full illuminating power in the standard burner; while that of the Gaslight and Coke Company will be penalized by fully a candle, owing to the system of testing not being one to do their gas the same measure of justice.

The maintenance of a flame of 3 to 3½ inches in the standard burner will consume the gas of any of the three Metropolitan Companies in a manner that will fulfil the axiom laid down, of burning the gas to its full advantage in the standard burner, and if adopted would secure the uniform method of testing so strongly advocated by the City Corporation and the London County Council witnesses.

With reference to the use of the standard argand burner for testing, I quote the following remarks made by Professor Vivian B. Lewes in a paper he read before the International Congress at Glasgow, in 1901: "The 'London' argand is a beautifully constructed scientific burner, devised to supply the right amount of air to ensure the proper combustion of a gas-flame 3 inches in height. Directly the flame is either materially longer or shorter than this, the conditions of combustion are altered. But by burning the gases at such a rate of flow as will yield a 3-inch flame, taking the candle power, and then calculating to a 5 cubic feet rate of flow, accurate results can be obtained for gases having any candle power between 10 and 30 candles; and this method of testing I should have preferred from a scientific point of view."

DR. FRANKLAND'S EVIDENCE.

Testing.

"With carburetted water-gas enrichment, the flame from 5 cubic feet an hour consumption does not fill the whole chimney, and you could burn it at a higher rate, and get a higher efficiency." In other words, Dr. Frankland admits that the present mode of testing the Gaslight and Coke Company's gas does not comply with the spirit or letter of the Act, which specifically states that the gas should be burned to the best advantage in the standard burner. "If we come to the question of fairness, then I say that the Gaslight and Coke Company's ought to be called 18-candle gas." This is an emphatic statement as to the under-valuation of the gas supplied by the Gaslight and Coke Company under the present system of testing for illuminating power.

Sulphur Compounds.

Mr. Carr gives evidence that "to keep the sulphur within statutory limits presents no difficulty, and very little expense to the management of a gas-works;" also that "it is no hardship to an authority having the requisite plant to comply with the statutory conditions." *Note.*—The Widnes restriction is 20 grains per 100 cubic feet. Mr. Carr states that "the question of sulphur is a very elusive matter;" again that "sulphur compounds are very erratic," that they are "unstable compounds difficult to deal with." Mr. Carr states in the case of London Companies "the smell is on their own works." This is not so; and, as given in my evidence, "the nuisance has been the subject of remonstrance and legal proceedings by local authorities."

Reburning Sulphur Lime not done.

Sulphur lime cannot be reburnt with any advantage, because of the sulphate produced in reburning rendering the lime of no value for purification. Independent tests show that over a period of one month the sulphur at Widnes averaged 31·18 grains. In Mr. Carr's evidence on the Crystal Palace Bill, 1903, he stated that at occasional times it had been found at Widnes to exceed the limit of 20 grains, traceable to what might be called partly neglect. Again, Mr. Carr admits that he has sometimes had his sulphur up, due to using new oxide. All this goes to prove that Mr. Carr has not in practice considered the elimination of the sulphur compounds as being of importance; and his evidence as as to it being so must be of little value in the light of his habitual practice in neglecting to take steps for their effectual reduction.

MR. CARPENTER'S EXAMINATION.

In the course of the above, there are references to the Gaslight and Coke Company's gas, and comparisons are made with that supplied by the South Metropolitan Company.

Comparison of Calorific Power.

Mr. Carpenter quotes Professor Boys, who gave evidence on the above point from memory only, subject to correction, stating the 16-candle gas of the Gaslight and Coke Company to have a calorific power of 145 calories, as compared with 150 calories for the South Metropolitan 14-candle gas. These figures, translated into British thermal units, are respectively 576 and 596. Mr. Carpenter states the calorific value of South Metropolitan gas to be 595 gross—confirming the figure given for the South Metropolitan gas by Professor Boys. The figure given for the Gaslight and Coke Company's gas is too low; its net value, according to Professor Frankland's evidence, being 567, while that of the South Metropolitan averages 530 units. The net calorific vaiue—that is, the value assuming that the water vapour generated during combustion passes off in the condition of steam—is the measure of useful value generally attained by the consumer. The percentage of the gross calorific value thus lost by the consumer is approximately 1 per cent. more in the combustion of pure coal gas than in a mixture of coal and carburetted water gas.

Comparative "Welsbach" Value of 14 and 15 Candle Gas.

This, as given in evidence by myself and Professor Frankland, is inferior in the case of the lower power gas to the extent of nearly 10 per cent. This comparative valuation was arrived at by a number of operators after a most careful and exhaustive series of experiments.

NOTES ON MR. CARR'S EVIDENCE AND EXAMINATION.

Reference to Portable Photometer Tests at Widnes.

The time of the year when tests were made is not stated, nor the atmospheric conditions; neither is the illuminating power found by the tests given. When benzol enrichment was tried about two years back by a Suburban Company, it failed to carry; and carburetted water gas was decided on for enrichment. "Benzol enrichment is less permanent than that of cannel or carburetted water gas." At the same time this statement is made, Mr. Carr gives particulars of tests with the portable photometer, showing its reliability as a testing instrument, and to the effect that in his case benzol enrichment is capable of travelling considerable distances. In his experience with the portable photometer in the Gaslight and Coke Company's district, at Board Schools, he has found the results "fairly comparable" with those given by the official stations. *Note.*—If the results compare, there is no need for further expense to be incurred in portable photometer testing. The argument is generally that the gas at places other than the testing-stations is considerably lower in illuminating power.

The Chairman asked witness whether he would like to say anything more on the sulphuretted hydrogen test; and Mr. Trewby thereupon referred to a case which had just previously been brought before him (Lord Rayleigh) on appeal, thinking it might be interesting to members of the Committee to know what was in the Company's mind with regard to it. It was a case in which the gas when tested in the same building with two independent tests showed no trace of sulphuretted hydrogen, and that distributed to other official testing-stations also showed no trace whatever. Yet in the Tudor Street official station sulphuretted hydrogen was indicated upon three tests. In their endeavour to account for this, they found that certain bacteria were present in the service -pipe, where liquid would accumulate, because there was no fall; and these bacteria were propagated. An experiment was made with the scrapings from the internal surface of the pipe; and every precaution was taken. There was no sulphuretted hydrogen in the gas being experimented with, yet when it was passed through the vessel a sulphuretted hydrogen stain was shown on the outlet—the inference being that these bacteria had, under certain conditions, the means of developing sulphuretted hydrogen. He could not say what sort of bacteria they were. The investigation was, however, still going on; and there was sufficient evidence already to show that this condensable matter in the service-pipe contained bacteria, and (as far as the experiments went) had the power of liberating sulphuretted hydrogen from any sulphides that were brought in contact with them.

Apart from this explanation, there were other considerations with regard to this particular case. The gas was tested at certainly six

other places, and no trace of sulphuretted hydrogen was discovered either in the official or the Company's test. In the Tudor Street station the Company's service-pipe was only 18 inches away from the official service-pipe; and no trace was shown. The Referees examined all the apparatus, and found the Company's was in perfect order. The Company had also a testing apparatus in the valve-room beneath the station, and no trace of sulphuretted hydrogen was shown there; so that it was purely local. From the fact that sulphuretted hydrogen was not found at the other testing-places, there could not have been an appreciable proportion coming along the main. The stain shown would represent less than 1 ten-thousandth part of a grain.

With regard to the calorific power of the gas, his own figure came out at 565 B.T.U. net; but he had quoted Professor Frankland's figure of 567 B.T.U. It was only the net value that should be taken into account, because this was really what the consumer obtained. If the gross was taken, a certain percentage should be deducted from it. In the case of coal gas, this was somewhere about 9 per cent.; and in that of carburetted water gas it was 8 per cent. So that there was really a difference of 1 per cent. between the two. Therefore, if the calorific value of both was taken on the gross, comparable figures were not obtained.

In reply to the Chairman, witness said his Company were still using benzol enrichment to a slight extent; but most of the manufacturing stations possessed carburetted water-gas plant. They had for some little time been in rather an unsettled condition with regard to water-gas manufacture. It was stated that a Bill was to be promoted by the Board of Trade; and therefore the Company held their hands. If, however, things remained as at present, they would certainly instal carburetted water-gas plant wherever it was necessary to carry on enrichment, with a view to dispensing altogether with benzol.

Mr. D. Milne Watson.

Mr. D. Milne Watson, the General Manager of the Gaslight and Coke Company, handed in the following memorandum as to the working of the sliding-scale and redemption fund in connection with the Company.

The sliding-scale of price and dividend was originally introduced in connection with gas supply in the Metropolis in 1875, and was applied to this Company in 1876. Prior to this, the Companies could divide profits up to a maximum of 10 per cent.; and it was contended that the introduction of the sliding-scale would give the Companies an inducement to reduce the price of gas as much as possible. This Company, under the sliding-scale, was entitled to increase the standard dividend of 10 per cent. by 5s. per cent. for every 1d. reduction in the price of gas below 3s. 9d. per 1000 cubic feet. The effect of this provision was to make the shareholders and the consumers partners; it being to the direct advantage of both that the price of gas should be reduced. The sliding-scale is still in operation, though it has undergone some modification. Under the Company's Act of last year, the new standard dividend of 4 per cent. (which on the converted capital is equivalent to the old 10 per cent.) is nominally increased by 2s. 8d. per cent. for every 1d. by which the price of gas is reduced below the new standard price of 3s. 4d. per 1000 cubic feet. The principle of the sliding-scale remains the same; and it may be said that the present scale is even more favourable to the consumers than that of 1876. The shareholders do not receive the whole of the 2s. 8d. increase on the dividend, as a portion of it has, under the provisions of the Act, to be carried to a redemption fund (see statement below). The reduction of 1d. in the price of gas means to the consumers a saving of, approximately, £80,000 per annum; whereas the shareholders only receive extra dividend to the extent of less than £20,000 per annum. So that out of a total of £100,000, the consumers take £80,000, or four-fifths, and the shareholders take about £20,000, or (allowing for redemption fund) less than one-fifth.

It has been shown by the evidence submitted to the Committee that the Gaslight and Coke Company will only be able to effect a saving of ¾d. per 1000 feet by the reduction in the illuminating power of the gas from 16 to 14 candles. This saving would not, it is contended, justify any permanent reduction in the Company's standard price, which was fixed last year at 3s. 4d., even if a reduction of a fraction of a penny were feasible. To reduce the standard price more than ¾d., would be actually to penalize the shareholders, on account of the introduction of 14-candle gas. If, however, it should be thought desirable in the interests of the consumers that the illuminating power of the gas should be lowered to 14 candles, the Company contend that it is not necessary to reduce the standard price of the Company's gas in order to give to the Company's consumers the benefit of the bulk of any saving which may be effected by the alteration, since, if the Company save ¾d. per 1000 cubic feet, and are thereby enabled to reduce the price of gas, the consumers would, by the operation of the sliding-scale, obtain four-fifths of the advantage—*i.e.*, on the above calculation, out of a saving of £60,000 the consumers would get £48,000, as against the shareholders' £12,000, which is subject to reduction on account of the contribution to redemption fund.

The table will show the general effect of the working of the sliding-scale and redemption fund.

Witness said the particular moral of his memorandum was that the Company might save ¾d. per 1000 cubic feet by reducing the illuminating power of the gas from 16 to 14 candles. In their opinion, this saving would not—or ought not to—necessitate a reduction in the standard price, which had just recently been altered from 3s. 9d. to 3s. 4d. A reduction of ¾d. for 2 candles would hardly be feasible; and to lower it more than this would actually penalize the shareholders, because the Company could not save more.

As to the sliding-scale, it had to be borne in mind that if the shareholders' proportion was increased by any very large amount, it would also make it more difficult to reduce the price of gas. At present it cost his Company £100,000 to lower the price 1d.—that was to say, £80,000 went to the consumers, and about £20,000 to the shareholders. If the shareholders' proportion were increased by £20,000, it would to this extent become more difficult to reduce the price of gas. In other words, the Company would have to save £120,000 before they could lower the charge 1d. Under the existing plan, the consumer got the bulk of the saving. If the Company were to save ¾d. per 1000 cubic feet, and were therefore enabled to reduce the price of gas, the consumers would, by the operation of the sliding-scale, obtain four-fifths of the advantage, whereas the shareholders would only get one-fifth. Therefore, automatically, the consumers derived the benefit of any saving, whether the standard price was reduced or not. The difficulty of increasing the shareholders' proportion was to find a basis on which to frame a new sliding-scale, especially in the case of his Company. The redemption fund, by its action, did away with a certain amount of inducement. For instance, when the price of gas was reduced from 2s. 10d. to 2s. 9d. per 1000 cubic feet, out of the £20,000 that the shareholders would get, no less than £10,000 had to go to the redemption fund. The Company's contention, however, was that if the matter was left to them, they would naturally reduce the price of gas as fast as practicable. The possibility of distributing a larger dividend, though not a very great inducement, still had its money value.

The Gaslight and Coke Company.

SLIDING-SCALE OF DIVIDEND AND REDEMPTION FUND.

Price of Gas per Thousand.	Redemption Fund. Amount.	Redemption Fund. Approximate Rate.	Net Rate of Dividend Distributed.	Authorized Rate of Dividend.
s. d.	£	Per Cent. s. d.	Per Cent. £ s. d.	Per Cent. £ s. d.
3 9	—	—	3 6 8	3 6 8
3 8	—	—	3 9 4	3 9 4
3 7	—	—	3 12 0	3 12 0
3 6	—	—	3 14 8	3 14 8
3 5	—	—	3 17 4	3 17 4
3 4	—	—	4 0 0	4 0 0
3 3	10,000	1 4	4 1 4	4 2 8
3 2	10,000	1 4	4 4 0	4 5 4
3 1	10,000	1 4	4 6 8	4 8 0
3 0	20,000	2 8	4 8 0	4 10 8
2 11	20,000	2 8	4 10 8	4 13 4
2 10	20,000	2 8	4 13 4	4 16 0
2 9	30,000	4 0	4 14 8	4 18 8
2 8	30,000	4 0	4 17 4	5 1 4
2 7	30,000	4 0	5 0 0	5 4 0
2 6	40,000	5 4	5 1 4	5 6 8

GLASGOW CORPORATION GAS SUPPLY.

The Accounts for the Year.

The accounts of the Gas Department of Glasgow Corporation for the year ending May 31 were approved by the Gas Committee on the 17th ult., and have now been issued. The Committee report as follows.

The gross revenue amounts to		£819,913
and the gross expenditure to	£675,515	
to which is added depreciation written off capital assets	30,540	
		706,055
The balance carried to profit and loss account being		£113,857
The Committee had to meet the following requirements during the year.		
(1) Annuities on stocks, so far as unredeemed or unconverted	£23,384	
(2) Contributions to Corporation loans fund, in respect of 3 per cent. Corporation stock redeemable 1921, issued in lieu of gas annuities	28,645	
(3) Interest on borrowed money and redeemed loans, &c.	35,907	
(4) Sinking fund	25,859	
		113,796
Leaving a surplus on the year's operations of		£61
To this add the balance brought from last year		33,019
Making a sum to be carried forward to next year's account of		£33,080

Tar and Liquor.—Your Committee regret that the price for residuals has fallen very much during the year, and that this has resulted in a reduction in income of £22,891. The average price received per ton of coal carbonized was 3s. 9·825d., as compared with 4s. 5·105d. for the previous year; being a decrease of 7·727d. per ton.

Coke.—The quantity of coke sold during last year was 270,002 tons, as compared with 281,148 tons for the previous year; being a decrease of 11,146 tons. The average price received was 5s. 9·68d. per ton, as compared with 5s. 5·28d. for the previous year; being an increase of 4·4d. per ton.

Coal.—Your Committee, as usual, advertised for tenders for coal to be supplied during the coming year, and have concluded contracts for almost the whole quantity required, at prices under those of last year. The quantity of coal carbonized during the year amounted to 706,853 tons, as compared with 707,393 tons for the preceding year, a decrease of 540 tons. The quantity of gas produced per ton of coal carbonized during the year was 9396 cubic feet, as compared with 9092 cubic feet for the preceding year, an increase of 304 cubic feet per ton.

Annuities.—During the year £925 of 9 per cent. gas annuity stock

has been cancelled, the loans fund issuing in substitution therefor to the holders £2775 of 3 per cent. Corporation stock, redeemable in 1921. This conversion was made at the rate of £300 of 3 per cent. stock for each £100 of 9 per cent. gas annuity stock cancelled.

Sinking Fund.—Your Committee have applied £8498 of the amount of the credit of the sinking fund to the extinction of £2685 of 9 per cent. and £370 of 6¾ per cent. gas annuity stocks; and the annuities formerly payable upon these stocks now cease to be a charge upon the revenue of the department. There has also been redeemed during the year, by the application of moneys at the credit of the same fund, £8126 of 3 per cent. Corporation stock, £65,000 of loans raised under the Gas Act of 1869, and the Sewage, &c., Act of 1898, and a further amount of £10,625 of loans raised under the Tramways and General Order Confirmation Act, 1901. The amount added to the sinking fund during the year was £38,694. The sinking fund, with its accumulations, now stands at £502,590, of which there has been already applied in the redemption of borrowed money and annuities £488,875; leaving still available for either of those purposes the sum of £13,714.

Capital Expenditure.—The amount expended on works and plant, as appearing in the books at May 31, 1904, was		£2,146,919
To which add the amount of the premium account for converted annuity stock at the same date		174,311
		£2,321,230
And the amount written off works and plant in the name of depreciation at same date	£1,321,193	
Less depreciation written off works and plant, which, having been sold, have disappeared from the books	10,736	
		1,310,457
Making the total amount expended on capital account, as at May 31, 1904		£3,631,687
The annuity stocks so far as unconverted at May 31, 1904, amount to	£276,058	
The amount due to the Glasgow Corporation loans fund at that date was	£1,671,706	
From which deduct the amount at the credit of the sinking fund still available for repaying loans	13,714	
	1,657,992	
		£1,934,050
Showing a surplus of expenditure on capital account over liabilities of		£1,697,636
If from this were deducted—		
(1) The amount of the premium account	£174,311	
(2) The differences between the face and market value of the stocks so far as unconverted and unredeemed (which will fall to be added to premium account when conversion has taken place)	439,286	
Together amounting to		613,597
The surplus would be reduced to		£1,084,039
The net expenditure on works and plant, including premium account, on June 1, 1903, was		£2,087,234
To which add the net amount expended on works, &c., during the year to May 31, 1904		262,686
And a premium for converting £925 of 9 per cent. annuity stock of		1,850
In all		£2,351,770
Deducting from this sum depreciation written off works and plant during the year, amounting to		30,540
Leaving the amount expended on works and plant at May 31, 1904, as reduced by depreciation		£2,321,230

The amount borrowed during the year for capital purposes was £235,000.

Borrowing Powers.—As will be seen from the statement of loan capital, the borrowing powers of the Corporation under the Gas Acts are nearly exhausted. In order to complete the new gas-works and chemical works at Provan, and to meet the cost of other new works either in course of construction or in contemplation, it will be necessary to obtain additional borrowing powers. Your Committee have, therefore, to recommend that an application be made to Parliament next session for additional borrowing powers, under the Gas Acts, to the extent of £1,000,000.

Price of Gas.—Having regard to the result of the year's operations as before recorded, your Committee recommend to the Corporation that the price of gas be retained at the same rate as last year, viz.: (1) Within the city and suburbs generally: Lighting purposes, 2s. 1d. per 1000 cubic feet; motive power purposes, 2s. (2) Within the Milngavie area of supply: Lighting purposes, 3s. 1d. per 1000 cubic feet; motive power purposes, 3s.

Sale of Gas.—The analysis of the sale of gas for the past year, as compared with the sale for the previous year, is given at top of column 2.

The works and mains have been maintained in an efficient condition during the year out of revenue.

The first section of the new works at Provan (with the exception of the retorts and machinery in No. 2 Retort-House) is practically ready for the manufacture of gas. All the retorts and machinery for No. 1 Retort-House, condensers, exhausters, scrubbers, purifiers, and meters, with their various connections and appliances, are almost completed. The two gasholder tanks are built, and one of the gasholders, with relative guide-framing, is finished and tested; while the second holder is well advanced, and is expected to be ready for the winter season. The trunk mains to Dawsholm and Dalmarnock from Provan are completed and filled with gas. The district main to Duke Street and Parson Street is well advanced. The Turbo exhauster, for forcing the gas from Provan into the holders at Dalmarnock is ready for testing, and will be erected at an early date; all the connections being in position. The plant for the manufacture of oil gas at Provan, for enrichment purposes, is in progress, and will shortly be completed. The residual products works at Provan are ready for occupation. The plant for distillation of the tar and the manufacture of sulphate of ammonia is also complete. The plant for the manufacture of benzol and carbolic acid is in course of construction, and should be ready by the end of September. Considerable progress has been made with the extension of the workshops at Wall Street. When this addition is completed, it will enable the work in this department to be carried on in a more expeditious and profitable manner. About 34 miles of new mains have been laid during the past year.

—	Rate per 1000 C. Ft.	Year 1902-3. Consumption.	Rate per 1000 C. Ft.	Year 1903-4. Consumption.
	s. d.	Cubic Feet.	s. d.	Cubic Feet.
I.—Within the City and suburbs generally:—				
(1) Lighting	2 4	5,002,415,450	2 1	5,061,103,400
(2) Gas-engines	2 0	206,515,700	2 0	318,437,900
(3) By contract	2 4	428,612,750	2 1	439,946,900
II.—Within the Milngavie area of supply:—				
(4) Lighting	3 4	11,049,200	3 1	14,319,400
(5) Gas-engines	3 0	329,300	3 0	494,400
(6) By contract	3 4	1,111,525	3 1	1,191,180
		5,650,033,925		5,835,493,180
Used at works		58,109,300		59,493,900
		5,708,143,225		5,894,987,080

The number of gas-engines in use, and the total horse power, for this year and the preceding year, are as follows:—

	Number.	Horse Power.
May 31, 1903	1,767	11,096
May 31, 1904	1,820	13,734
Increase	53 = 3 per cent.	2,638 = 24 per cent.

The number of meters in use on May 31, 1904, was 222,011; being an increase of 5889 over the number in use at the same date last year. During the year 21,100 meters were repaired, and 26,197 were examined while in use, of which 23,620 were found in a satisfactory condition, and 2577 were found defective and removed. The number of gas-stoves on hire as at May 31 was 25,657. The number of gas heating and cooking appliances sold during the year was 1979.

The stock capital account shows that the 9 per cent. stock originally amounted to £300,000; but of this sum £69,152 has been converted into 3 per cent. redeemable stock, and £30,293 has been redeemed out of the sinking fund, leaving £200,553. But the operation of conversion raises the sum to £264,141. The 6¾ per cent. stock originally amounted to £115,000; but of this £28,805 has been converted and £10,690 redeemed, leaving £75,000. Annuities payable on these stocks originally amounted to £34,762; but by the operation of conversion and redemption, this sum has been reduced to £23,146. The loan capital authorized amounts to £3,200,000, of which £1,400,000 is for electricity purposes. The total amount borrowed is £2,925,000, leaving to be borrowed for gas purposes £25,000, and for electricity £250,000.

The year's capital expenditure amounted to £262,687. Of this sum, £150,415 was expended upon the Provan station and works, £2530 upon workshops in Stirling Street, £2385 upon chemical works at Dawsholm, £142 upon chemical works at Tradeston, £38,474 upon chemical works at Provan, £49,420 upon pipes and the cost of laying, £12,123 upon meters, and £7422 upon gas-stoves. The total expenditure upon the new works at Provan has been £643,340. The total capital outlay upon gas-meters has been £185,379, and upon gas-stoves £50,398. The capital account amounts to £2,321,230, and of this there has been redeemed £416,545.

Of the revenue for the year of £819,913, and which was £65,500 less than in the preceding year (due chiefly to the reduction in the price of gas by 3d. per 1000 cubic feet), £605,037 was derived from the sale of gas. This was £48,866 less than in the preceding year. Coke realized £68,569—an increase of £3864. Ammoniacal liquor and tar realized £136,625—a decrease of £22,891. The amount received for hire of stoves amounted to £7078—an increase of £307.

The total working expenditure amounted to £675,515. Manufacture of gas cost £562,818—a decrease of £25,449. There was carbonized 706,853 tons of coal, which, at an average price of 10s. 7·419d. per ton, cost £375,277—a decrease of £23,362. Purifying materials, oil, water, and sundries at works cost £33,243—a decrease of £1174. Salaries of engineers, superintendents, and officers at works amounted to £3927—a decrease of £637. Workmen's wages amounted to £102,314; but of this £10,015 was charged to coke account, leaving £92,299—an increase of £3048. Repairs and maintenance of works and plant, machines, apparatus, tools, materials, and labour amounted to £48,345—a decrease of £5716. The carting and stabling account amounted to £7727—an increase of £125. The distribution of gas cost £63,072—a decrease of £3069. The salaries of surveyor and inspectors of meters and clerks in the survey room amounted to £12,944—an increase of £323. The repair, maintenance, and renewal of mains and service-pipes, including materials and laying, paving, and labour, cost £32,148—a decrease of £3338. Repairing and refixing

meters cost £17,147—an increase of £9. Regulators for public lamps cost £256—an increase of £97. Miscellaneous charges and accidental damages amounted to £587—a decrease of £148. Repairs of gas-stoves amounted to £6968—a decrease of £681. Rents and feu-duties amounted to £8416—an increase of £10. Rates and taxes amounted to £21,929—the enormous increase of £19,021. Management cost £12,658—an increase of £1542. Law charges amounted to £223—a decrease of £81. Parliamentary charges amounted to £105—a decrease of £468. Retiring allowances amounted to £1324—an increase of £196. To expenditure falls to be added the amount written off for depreciation—£30,540—which is apportioned as follows: On works, at 1½ per cent., £9648; on pipes, at 1¾ per cent., £5058; on meters, at 6 per cent., £11,059; and on stoves, at 10 per cent., £4775. The amount written off for depreciation in the preceding year was £50,037. Adding depreciation, the total expenditure is raised to £706,056, which leaves the balance of £113,857 to be carried to profit and loss account. A year ago the sum that was carried to the profit and loss account was £151,311.

The quantity of gas manufactured was: At Dalmarnock, 1,694,538,000 cubic feet; at Dawsholm, 2,813,849,000 cubic feet; at Tradeston, 1,948,941,000 cubic feet; and at Temple, 184,563,000 cubic feet—a total of 6,641,891,000 cubic feet. This was 210,012,950 cubic feet more than in the preceding year, equal to 3·26 per cent. The quantity of gas sold was 5,894,987,080 cubic feet, and the quantity unaccounted for 746,903,920 cubic feet, which is equal to 11·245 per cent. In the year preceding, the unaccounted-for gas amounted to practically the same amount—11·25 per cent.

PROVINCIAL GAS COMPANIES.

A Satisfactory Report from Brighton.

In the report which was sent out to the proprietors of the Brighton and Hove General Gas Company previous to the meeting on Friday, the Directors expressed their pleasure at being able to record the continued progress of the business during the six months to June last. Compared with the corresponding six months of 1903, the sale of gas exhibited an increase of 4·9 per cent.; while the return from the sale of residuals was also satisfactory. Reductions in the charges made to consumers for the hire of meters, fittings, stoves, fires, &c., have recently been sanctioned by the Board; and it is hoped that these concessions will tend to further encourage the use of gas for motive power and for heating and cooking purposes. The profits for the half year, including interest on deposits, amounted to £28,965, to which had to be added £11,837 brought forward from the preceding accounts. After paying interest on the debenture stock and transferring a sum of £2000 to the insurance fund, there remained £36,257 available for division; and out of this, the Directors recommended the payment of the statutory dividends for the half year—namely, 6 per cent. per annum on the "B" preference stock, 4 per cent. per annum on the "C" preference stock, 11 per cent. per annum on the original ordinary stock, and 8 per cent. per annum on the "A" ordinary stock. After the payment of these dividends (which would amount to £23,652) there would remain a balance of profit of £12,604 to be carried forward.

Record Sale of Gas at Hartlepool.

In the report which was submitted at the annual meeting last Tuesday, the Directors of the Hartlepool Gas and Water Company stated that the total receipts on revenue account for the twelve months ending June 30 were £90,616, and the expenditure £54,333, leaving a balance of £36,283 to the credit of the profit and loss account, out of which £3659 had been paid for interest on loans and £15,316 for interim dividend. They recommended that, out of the remaining amount of £17,306, the sum of £1000 should be provided for the renewal of worn-out retort-benches, and a dividend be paid for the half year at the rate of 5 per cent. per annum, less income-tax, on the whole of the paid-up consolidated capital of the Company. The first installation of gaseous firing for retorts has been completed, and has proved of great advantage; and it will be necessary to extend the system at an early date. A new reservoir and pumping plant has also been put into operation. The Chairman (Mr. W. F. Fisher, J.P.), in moving the adoption of the report, said it was gratifying to find that, notwithstanding many prophecies to the contrary, and the continued depression of trade, the sale of gas was a record one. Not only was the decrease of the preceding year wiped out, but the figures showed an increase upon the sale of the year before that of nearly 9 million cubic feet. This had been contributed to not only by the increase in the supply for ordinary lighting purposes, but also in the number of slot-meter consumers, as well as those using gas for domestic and trade purposes. In only one department—that of public street lighting—was there any decrease; the quantity used for that purpose by both Corporations being less. There were 1029 new slot-meter consumers, making a total of 6186, from whom a revenue of about £6000 had been derived. The receipts for sulphate of ammonia were somewhat less; but coke and tar more than met the deficiency. Dealing with the water supply, he said that the new reservoir at Crookfoot would place the Company in a position to amply meet the progressive demand for soft water. The Directors had to congratulate the shareholders on the completion of the work at a capital charge which compared most favourably with other similar work. The original estimate provided for a reservoir of 150 million gallons capacity for £65,000; whereas a reservoir of 200 million gallons had been completed at a cost of £63,394. The total quantity of water supplied for all purposes had been 1360 million gallons, of which 620 million were for trade purposes. The report was adopted.

Prosperity at Hastings.

Dr. G. G. Gray, J.P., the Chairman of the Hastings and St. Leonards Gas Company, in moving the adoption of the report and

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 654.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
500,000	10	Apl. 14	10½	Alliance & Dublin 10 p.c.	20—21	+½	5 0 0	75,000	5	June 29	5	Malta & Medn., Ltd.	4¼—4⅜	..	5 5 3
100,000	10	,,	7½	Do. 7 p.c.	13¼—14¾	+⅛	5 3 5	560,000	100	Apl. 5	5	Met. of) 5 p.c. Deb..	102—105	..	4 15 3
200,000	5	May 12	6¼	Bombay, Ltd.. . . .	6⅜—6⅝	+¼	4 10 4	250,000	100	,,	4½	Melbourne) 4½ p.c. Deb.	100—102	..	4 8 3
140,000	5	,,	6½	Do. New, £4 paid	4⅝—5⅛	..	4 18 11	541,920	20	May 27	3½	Monte Video, Ltd. . .	9⅛—10⅛	..	6 13 4
50,000	10	Aug. 31	14	Bourne-) 10 p.c. . .	28—29*	..	4 16 7	1,515,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	104¼—104⅝	..	4 5 11
251,800	10	,,	7	mouth Gas) B 7 p.c. .	14¼—15⅛*	..	4 10 4	406,525	Stk.	July 1	3½	Do. 3½ p.c. Deb.	92—92½	..	3 15 8
53,200	10	,,	6	and Water) Pref. 6 p.c.	14—15*	..	4 0 0	15,000	10	Aug. 31	10	North Middlesex 10 p.c.	19—20*	..	5 0 0
380,000	Stk.	Aug. 12	12	Brentford Consolidated	235 240	..	5 0 0	52,940	10	,,	7	Do. 7 p.c.	13—14*	..	5 0 0
300,000	,,	,,	9	Do. New . . .	177—182	..	4 18 10	300,000	Stk.	May 12	8	Oriental, Ltd. . . .	140—145	..	5 10 4
50,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11	600,000	5	Mar. 29	7	Ottoman, Ltd. . . .	5½—6½	..	5 12 0
206,250	,,	June 10	4	Do. 4 p.c. Deb. .	102—105	..	3 16 2	235,005	Stk.	—	6⅝	Plym'th & St'house 5 p.c.	—	..	—
220,000	Stk.	Mar. 10	11†	Brighton & Hove Orig.	212—217	..	5 1 5	398,490	5	Apl. 28	10	Primitiva Ord. . . .	4—4½	..	11 2 2
246,320	,,	,,	8†	Do. A. Ord. Stk. .	150—155	..	5 3 3	796,980	5	July 28	5	Do. 5 p.c. Pref. .	4—4⅛	..	5 11 1
450,000	20	Apl. 14	10	British	39—40	..	5 0 0	492,200	100	June 1	4	Do. 4 p.c. Deb. .	92—94	..	4 5 1
100,000	Stk.	Aug. 12	6	Bromley, Ord. 5 p.c. .	114—118	..	5 1 9	851,070	10	Apl. 28	7	River Plate Ord. . . .	10⅝—11⅛	..	6 4 5
165,700	,,	,,	4½	Do. do. 3½ p.c. .	88—93	..	4 16 9	300,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	93—95	..	4 4 3
500,000	10	May 12	7	Buenos Ayres (New) Ltd.	10⅞—11⅛	..	6 4 5	250,000	10	Mar. 29	7	San Paulo, Ltd. . . .	11—12	..	5 16 8
250,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	92—94	..	4 5 1	70,000	50	June 29	5	Do. 5 p.c. Deb.. .	49—51	..	4 18 0
150,000	20	July 14	8½	Cagliari, Ltd.	21—23	..	7 3 6	135,000	Stk.	Mar. 10	10	Sheffield A	237—239	..	4 3 8
100,000	10	May 27	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4	209,984	,,	,,	10	Do. B	235—238	..	4 4 0
101,006	10	Apl. 28	4½	Do. 4½ p c Pref. .	9½—9¾	..	4 12 4	523,498	,,	,,	10	Do. C	234—236	..	4 4 9
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	51—53	..	5 13 2	123,998	Stk.	—	5	Shrews'bury Ord. 5 p.c.	—	..	—
50,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk	98—100	..	4 10 0	70,000	10	May 27	11	South African	15—16	..	6 17 6
1,375,000	Stk	Aug. 31	5⅛	Commercial 4 p c Stk. .	108—112*	+½	4 12 10	6,250,000	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	124—126	..	4 7 3
560,000	,,	,,	5	Do. 3½ p.c. do. .	104—107*	+½	4 13 6	1,832,700	,,	July 14	3	Do. 3 p.c. Deb.	87—89	..	3 7 5
450,000	,,	June 10	3	Do. 3 p.c. Deb. Stk.	85—87	..	3 9 0	575,000	Stk.	Aug. 31	5½	S'th Suburb'n Ord. 5 p.c.	115—120*	..	4 11 8
800,000	Stk.	June 10	6	Continental Union, Ltd.	102—107	..	5 12 2	60,000	,,	,,	5	Do. 5 p.c. Pref. . .	118—123*	+½	4 1 4
200,000	,,	,,	7	Do. 7 p.c. Pref.	135—140	..	5 0 0	112,533	,,	July 14	5	Do. 5 p.c. Deb. Stk.	133—138	..	3 12 6
486,090	10	July 14	11	European, Ltd. . . .	19—20	..	5 11 0	380,940	Stk.	May 12	5	Southampton Ord. . .	105—110	..	4 10 11
354,060	10	,,	11	Do. £7 10s. paid	13—14	..	5 17 10	87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
15,243,200	Stk.	Aug. 12	4⅛	Gas-) 4 p.c. Ord. . .	92—94	..	4 13 7	120,000	Stk.	Aug. 31	6¼	Tottenham) A 5 p c. .	118—123*	+1	5 1 8
2,600,000	,,	,,	3½	light) 3½ p.c. max. .	86—88	..	3 19 7	325,520	,,	,,	4¼	and) B 3½ p.c. .	95—100*	+⅜	4 15 0
3,799,735	,,	,,	4	and) 4 p.c. Con. Pref.	106—109	..	3 13 5	182,380	10	June 10	8	Edmonton)	8½—8¾	..	9 2 10
4,193,975	,,	June 29	3	Coke) 3 p.c. Con. Deb.	87—89	..	3 7 5	149,900	10	July 1	5	Tuscan, Ltd.	96—8	..	5 2 0
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	92—97	..	5 3 1	30,000	Stk.	Aug. 31	7¼	Do. 5 p c. Deb. Red.	148—153*	+1½	5 1 4
70,000	10	Apl. 28	11	Hongkong & China, Ltd.	15—16	..	6 17 6	255,636	,,	,,	6¼	Wands-) A 5 p.c. . .	118—123*	+1	5 1 8
3,800,000	Stk.	May 12	10	Imperial Continental .	200—205	..	4 17 7	50,000	,,	,,	5 17/20	worth) B 3½ p.c. . .	100—105*	+¾	5 3 4
473,600	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	95—98	..	3 11 4	59,416	,,	June 29	3	and) C 3½ p.c. . .	78—83	..	5 12 3
175,036	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c. .	112—117*	+1	5 2 7	745,872	,,	Aug. 12	5	Putney) 3 p.c. Deb. Stk.			
561,000	Stk.	Aug. 31	10	Liverpool United A . .	217—218*	+5	4 11 9	85,000	,,	,,	5	West Ham 5 p.c. Ord. .	95—100	..	5 0 0
718,100	,,	,,	7	Do. do. B .	158½—160*	..	4 7 3	160,000	,,	June 29	4	Do. 5 p.c. Pref. . .	115—120	..	4 3 4
306,083	,,	June 29	4	Do. do. Deb. Stk.	105—108	..	3 14 1					Do. 4 p.c. Deb. Stk.	103—108	..	3 14 1

Prices marked * are Ex div. † Next dividend will be at this rate.

accounts at the half-yearly meeting last Thursday, said that the six months to June had been satisfactory. Though the expenditure had been somewhat heavy, and though they were now paying on £50,000 capital which was unproductive as yet—he referred to the new works at Glyne Gap—the profits had been sufficient to meet this, as well as the dividends on the old ordinary capital, and still carry forward the very respectable balance of £850. Comparison between the last half year and the corresponding half of the previous year amply supported his statement. The accounts showed an increase in the amount of gas sold of 10,485,300 cubic feet, which was equivalent to an increase of 5 per cent., or, in the form of money, of £1679. There was an increase in respect of meters and stoves of £151, and from residuals of £286. Allowing for sundry variations in small items, there was a net increase in the revenue of £2032. There was an increase of £814 in respect of coke, and a decrease of £70 in regard to breeze. As to breeze, those who knew the state of the building trade in Hastings would not be surprised. There had also been a decrease of £443 in respect of tar. Deducting these decreases with regard to residual products, a net increase of £286 remained, as compared with a half year which itself showed an increase of £647. There was a decrease of £309 in the cost of manufacture, and a net increase of £1713 in the expenditure (chiefly owing to repairs), which, deducted from the increase of £2032 in the income, left an increase of £319 in the balance profit; the total profit for the half year being £11,855. In speaking of "heavy expenditure," he referred to necessary repairs. They might have spread these repairs over more than six months; but as the half year was so competent to pay for itself, there would be no object in dividing it. The progress of the new works was very satisfactory; and they conveyed a good impression of the advantages to be derived as soon as they were in working order. The advance in stoves and meters—a very lucrative portion of the business—had added materially to the increase. The report was adopted, and the statutory dividends were declared.

Increased Consumption at Queenstown.

The half-yearly meeting of the Queenstown Gas Company was held last week, under the presidency of Mr. Joseph O'Meara, J.P. The report submitted stated that the net profit on the working of the six months to June 30 was £457, to which is to be added £480, brought from the last account—making a total of £937. The Directors recommended the payment of dividends for the half year, free of income-tax, at the rate of 5 per cent., 2½ per cent. and 3½ per cent. per annum on the different classes of shares, carrying forward the balance of £519 to next account. The coal carbonized during the half year cost £203 less than the same period last year; while the sale of gas increased 11½ per cent. as compared with the first half of 1903—the increase being in the demand for lighting as well as for cooking and heating. The total sale was the greatest for any similar period (except 1900) in the existence of the Company. The profits on the sale of residuals increased by £129, notwithstanding the fact that less coal was carbonized. The Chairman, in proposing the adoption of the report, said that the business of the Company had much improved; and the working under Mr. Patterson, the new Manager, had been most satisfactory, both for economy and results in the carbonizing department, as well as in the sale of residual products. The report was adopted.

A Satisfactory Increase at Richmond.

The revenue of the Richmond Gas Company for the half year ending June 30 shows that the sale of gas amounted to 125,492,600 cubic feet, which realized £17,778. Public lighting and contracts brought in £1629, rental of meters £652, rental of stoves £354, and the maintenance of incandescent mantles £32. Residual products realized £6826. Coals cost £11,973, wages and gratuities at the works (in connection with the manufacture of gas) amounted to £1836, and repairs and maintenance of works and plant figured at £2907. The Chairman (Mr. T. J. Carless), in moving the adoption of the report, said that the receipts for gas showed an increase of about 3¾ per cent., which, taking into account the mild weather in the early part of the year, was satisfactory, and showed that the business was in a healthy condition. The item for maintenance of incandescent burners appeared for the first time; and he thought they might claim to have been successful in diminishing the trouble formerly experienced with regard to mantles. For 9d. per burner per quarter, an experienced man called at houses every month, and renewed the mantles as often as was necessary; the main point being to keep the burners clean and in good working order. Although the system offered no profit to the Company, it ensured satisfactory lighting, and so was a step in the right direction. The report was adopted; and the proceedings concluded with votes of thanks to the Chairman and Directors and the Engineer, Mr. Thomas May.

Fruitless Opposition at Waltham Abbey.

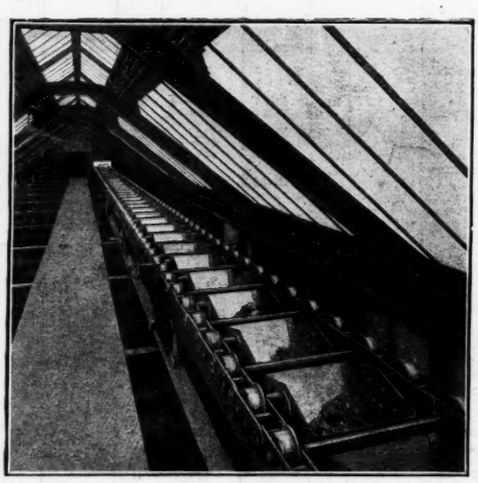
Speaking at the meeting of the Waltham Abbey and Cheshunt Gas Company last week, the Chairman (Mr. Alfred Kitt) stated that the business was progressing, though slowly. The increase of gas output during the past six months had been at the rate of 5·8 per cent., which was very satisfactory, considering the lightness of the season, and the early closing adopted in the district. Their application to Parliament for further powers had now passed through all its stages, and had received the Royal Assent. They had thus power to raise £40,000 of further share capital, and also to borrow on loan or mortgage an additional sum of £13,000. There was considerable opposition to the measure; and the Board of Trade, in consequence, held a special inquiry at the works. The opposition, however, completely broke down; and the Company established their case. For this they were much indebted to their able Manager (Mr. W. B. Randall) and to all concerned. They would now be able to meet their liabilities, and and pay off the loan from the bankers. The new main to the Sewardstonebury Estate had been completed, and the Company were guaranteed a return of 5 per cent. on the cost until the main became remunerative. They already had a number of new consumers; and so he

One of Three Conveyors in a London Power House.

Two similar Conveyors on order for London County Council.

Suitable for Handling Coke.

4 Installations in Hand.



Several Plants just Erected Abroad.

NEW CONVEYOR CO., LTD.,

SMETHWICK.

expected that before long it would be remunerative. The laying of this main, and the expenses of the Provisional Order, accounted for a good deal of the expenditure of capital that had occurred. The working results for the half year were exceedingly good, and hardly beaten by any company. They had made 10,486 cubic feet of gas per ton of coal, and sold 10,000 feet, showing a leakage of only 3·1 per cent. The business was thoroughly sound; and he looked forward to greater prosperity in the future. The report was adopted, and dividends at the rate of 8 per cent. per annum on the original or "A" shares, and 6 per cent. per annum on the "B" and "C" shares, were declared.

Increased Dividend at Waterford.

It was stated in the report submitted at the recent annual meeting of the Waterford Gas Company that the balance to the credit of profit and loss account at the end of the year was £2729, out of which the Directors recommend payment of the statutory dividend for the half year ended June 30 at the rate of 5¾ per cent. per annum on the consolidated stock, making, with the *ad interim* dividend, £5 7s. 6d. for the year. The payment of these dividends would leave a sum of £1122 to be carried forward to next account; but the Directors proposed to pay out of this sum the balance remaining due to the manufacturers for the new holder recently erected at the works—viz., £619. Notwithstanding the reduction in the price of gas from 4s. 6d. to 4s. 3d. per 1000 cubic feet, there was an increase of £1200 in the receipts for the year. A further reduction of 3d. per 1000 cubic feet came into force at Midsummer, making the present price 4s. The Chairman (Mr. George Lynch) in proposing the adoption of the report said that shortly after the last meeting, their five years' contract with the Waterford Corporation was sealed. In accordance with it, they had put up incandescent lamps all over the city, which was now lighted as well as any other city of its size in the kingdom. He was glad to say they had been able to make good the expectation he had held out of reducing the price of gas, which had been fixed for lighting purposes at 4s. per 1000 cubic feet from the beginning of the current quarter. They were pleased to be able to pay an increased dividend of £5 15s. per cent. for the half year, as they were entitled to do under their Act, which provided that for every 1d. the price of gas was reduced below the standard rate of 4s. 9d. they might add 1s. 3d. per cent. half-yearly to the dividend. The reduction in price to 4s. would enable them to increase the dividend to £6 2s. 6d. per cent.; and this rate they fully expected to be able to continue. The report was adopted.

Cheaper Power at Wolverhampton.

There was a net profit of £9866 on the operations of the Wolverhampton Gas Company for the six months to June; and this, added to the amount brought forward, left an available balance of £16,028. At the present price of gas, the dividend payable under the sliding-scale is 5¾ per cent. per annum on the consolidated stock and 6¾ per cent. on the new ordinary stock. The Directors, however, in their report recommended the payment for the half year of 3 per cent. on the preference stock, 5⅛ per cent. on the consolidated stock, and 3⅛ per cent. on the new ordinary stock, less income-tax; the balance of the dividend undivided (£470) to be carried to the reserve fund. The satisfactory result of the half-year's working, together with the lower price of coal, has enabled the Board to reduce the price of gas by 3d. per 1000 cubic feet, to users of engines, brazing hearths, and enamelling stoves, as from the last reading of meters. The Chairman (Mr. Henry Ward), at the meeting of the Company last Tuesday, stated that they were holding their own, and that there was a small increase all round, though the Corporation were not only providing private houses with electric light but were also superseding the public gas-lamps.

CRITICAL POSITION OF THE MADRID GAS COMPANY.

For the year 1903, the accounts of the Madrid Gas Company show a deficit of 893,009 pesetas. The general receipts from the Madrid, Alicante, Burgos, Jerez, Logroño, and Valladolid works were 5,078,640 pesetas, and the liabilities amounted to 5,971,649 pesetas. Owing to the critical position of the Company, a meeting was held in Madrid a short time ago, at which, according to "El Economista," representatives of French bondholders discussed an arrangement on the following basis: Each existing bond of 500 pesetas will be replaced by two of 250 pesetas each—one with variable and the other with fixed interest, which may amount to 5 per cent. Coupons for the years 1903 and 1904 will be exchanged for privileged bonds of 250 pesetas at the rate of one for each coupon of five bonds. Payment of the coupon in bonds with fixed interest will commence on April 1, 1905, and those with variable interest on July 1, 1906, according to results of the working in 1905. Amortization will be effected by transactions on the Bourse until the year's receipts (the bond coupons being paid in full) enable the Company to liquidate their debts. There will be a first reserve of 1,200,000 pesetas for the fixed interest and sinking fund, and a second for the sinking fund at par or extinction. A Syndicate of bondholders will be formed, without whose consent the Company cannot undertake any new business, make any agreement to alter the duration of the actual concessions, or alienate any part of the real or personal estate.

Lead Poisoning at Oldham.—Owing to the water from upland grounds under the control of the Oldham Corporation having to be collected from peaty soil, it has a tendency to dissolve the leaden service-pipes. As much as 0·5 ograin f lead per gallon has been found, and two instances of lead poisoning by the use of this water in Oldham have been reported. In several instances it has been found necessary to put in fresh service-pipes.

Tower Scrubbers

STEEL OR CAST IRON. BOARD FILLING.

WRITE DIRECT TO

C. & W. WALKER, LTD.,

Midland Iron Works:
DONNINGTON, near NEWPORT,
SALOP.

London Office:
110, CANNON STREET,
E.C.

GAS v. ELECTRICITY AT ORMSKIRK.

At a Meeting of the Ormskirk District Council on the 29th ult., Mr. Wilson gave notice of motion to rescind the minute approving the draft agreement of the Council with the National Electric Power Supply Company.

Mr. E. D. Martin, the Engineer and Manager to the Ormskirk Gas Company, wrote saying he was authorized by his Chairman to offer to fix, free of charge, three modern incandescent lanterns on the Cross, to demonstrate that they could supply a better light at less cost than could be obtained by electricity. By using more up-to-date incandescent burners, they would secure more light and a considerable reduction in the gas account. Mr. Ellis moved that the offer be accepted. The Company in their letter said they could produce a better light than electricity. He believed it would not be difficult to improve the gas lighting of the town. The Company had been prophetic with reference to the advantages of gas over electricity, and had become very active; but they were rather spasmodic in the way they did their work. They were now very solicitous about their welfare in suggesting that they could save money with certain burners. He did not want to say anything unfair against the Company; but they had not treated the town in the generous way they would like. Their gas was very dear; and, unlike other places, they would give no reduction in price to those who used engines. He was a great believer in open, healthy competition; and the presence of electric light in the town would probably wake up the Gas Company. The motion was carried.

In the course of an interview, Mr. Martin said that it was the Urban Council, and not the Gas Company, who were to blame for the poor lighting of the town. So far back as 1894, the Company had written to the Council offering to bear half the cost of erecting and maintaining for the first year four incandescent gas-lamps on the Market Cross. The offer was accepted, and the lamps gave satisfaction at the time; but the Council had not chosen to have more erected. At present, there are 168 lights, of which only 52 are incandescent. There were 120 obsolete lanterns in use. The majority of the shops in Ormskirk are, and have been for some years, lighted with up-to-date incandescent burners; and the tradesmen and other private consumers are perfectly satisfied with the light they are getting, and also with the price. The Ormskirk Urban District Council for public lighting, and the Guardians for the workhouse lighting, have made very little progress, inasmuch as the major portion of their lighting is obtained by gas through old-fashioned flat-flame burners, similar to those in use twenty years ago, and which consume 4 cubic feet of gas per hour and give a light equal to about 13 candles. By substituting incandescent burners, the consumption would be $3\frac{1}{2}$ cubic feet per hour, yielding a light of about 60 candles. The Council and the Guardians have for the last ten years been trying to introduce electricity as their illuminant; and this is the reason they have not used better means of lighting by gas, although the Company have continually tried to induce them to do so. The Company wish to give them better light for their money, and so save the ratepayers from unnecessary expense. The Company are prepared at any time to prove that incandescent gas is a cheaper and a better light than electricity, because it diffuses itself better; while electric light is condensed, and there is not so much power (light for light) as from incandescent gas. Dyer's Lane, Ormskirk, which is lit by incandescent gas, is acknowledged to be the best-lighted street in the town. Under the Company's scheme of lighting, there would be no increase in the rates. As to a question whether the workhouse would receive preferential treatment from the Company if the electricity scheme did not pass, Mr. Martin said the matter will be considered by his Directors at an early meeting, though the Guardians had never asked for it.

DUBLIN'S ELECTRIC LIGHT BURDEN.

Further information as to the unhappy state of affairs existing with reference to the enormous electric light undertaking on which the Dublin Corporation have embarked in so light-hearted a manner, is contained in a report submitted last month by Mr. Ruddle, the Electrical Engineer, to the Electric Lighting Committee. Mr. Ruddle commenced by stating that, unless very prompt action was taken, it would be impossible to give a satisfactory supply next winter; and he went on to point out that the matter had been before the Committee for the past four years, and that every hour which could now be saved was most valuable. The Lancashire boilers, he said, were still in the same unsatisfactory state as last winter, when it was impossible to obtain the full steaming power from them; a test on one of them by the contractors for the automatic stokers having proved that only two-thirds of the proper capacity was attained. The ash-conveyor from these boilers was also stated to be quite unworkable, and from an inspection of the driving gear, he felt certain that radical alterations would have to be made in the whole arrangements. It was further reported that the circulating pump engine on the small condenser was not working in a satisfactory manner; that the feed pumps had never been placed in proper working order by the maker, and required to be overhauled; and that the steam-range was still leaking very badly, and had never yet been in proper order. In addition to all this, the trunk mains between Fleet Street and Pigeon House were rapidly approaching the full carrying capacity sanctioned by the Board of Trade; and before any use could be made of the new plant on order, it would be necessary to have further mains laid down. He accordingly recommended the provision of three trunk mains of the same capacity as the existing ones (so as to provide for future work with adequate spare cable), thus avoiding the expense of re-opening the ground at an early period. Other minor deficiencies in the plant were also pointed out by Mr. Knowles, in a report written from the Central Station, Fleet Street.

In dealing with these reports, Mr. Robert Hammond, the Consulting

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.)	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND, IN ADDITION, 4,000,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

Engineer, remarked that Mr. Ruddle's statement as to the capacity of the boilers was not sufficiently precise; and that it astonished him to hear that it was only two-thirds of what should be the case. He suggested that Mr. Ruddle had possibly made a slight slip in his calculations. As to the provision of further trunk feeders, he did not think there was any necessity for incurring additional expenditure in this direction until the load considerably exceeded that for which the Pigeon House scheme provided. It would obviously be an extravagant policy to attempt to increase the capacity of the old mains by laying additional cables while there were new cables already laid in the old area which were at present but slightly loaded, and in some cases quite idle. The solution of the difficulty, in his opinion, was (1) to relieve the old mains of a part of their present load by transferring it to the three-phase distributors already laid, thus removing the congestion on the old distributors; and (2) to deal with every new demand by means of three-phase mains.

Whatever may be the decision of the Committee on the matter, it is abundantly evident that a deplorable state of affairs exists; and taking into account the enormous capital expenditure already incurred, and the heavy annual loss now falling on the ratepayers, it is difficult to see how the promises of a cheap supply of electricity are to be fulfilled.

LONGTON GAS AND ELECTRICITY SUPPLY.

The report of the Gas and Electricity Committee of the Longton Corporation for the year ending March 31 states that the total quantity of gas made was 151,934,000 cubic feet, of which 10,479,000, or 6·9 per cent., was carburetted water gas. The quantity sold for private consumption was 121,250,000 cubic feet, and for public lighting 18,251,000 feet; while 1,709,000 feet were used on the works. This made a total of 141,210,000 cubic feet, and left a loss through leakage, condensation, &c., of 10,724,000 feet, or 7 per cent. of the make. Sales of gas showed an increase of 1,523,000 cubic feet. There was an increase of 331 in the number of slot consumers, making a total of 3655; the average consumption per consumer being 10,183 cubic feet per annum, as against 12,180 feet in the previous year. The number of ordinary consumers was 1843, with an average consumption of 45,219 cubic feet. There were 68 gas-engines in the town; the consumption from this source during the year being 8,960,000 cubic feet, or an average of 131,000 feet, as against 126,000 feet for the previous year. The general results of the working were most gratifying; both the yield and quantity sold per ton making it a record year. The working profit was £11,249, from which had to be deducted £6121 for interest and sinking fund, and £2000 paid over to the Corporation in relief of the rates—leaving a balance of £3128. Out of this, the Committee recommended that the late Secretary's defalcations of £2970 should be written off, and the remaining £158 placed to the credit of the electricity account.

With regard to electric lighting, the working profit for the year, amounted to £714; but after payment of interest and sinking fund there was a deficiency of £765. To this had to be added the balance of £1146 brought from the previous accounts, making a total of £1911; and deducting the two sums of £170 and £158 transferred from the profits of the Gas Department, there was a total deficiency of £1583 to be carried forward.

In moving the adoption of the minutes of the Committee at last Thursday's meeting of the Town Council, the Chairman (Alderman Brookfield) remarked that the total income from gas used by private consumers was £19,804, as against £19,681 in the preceding year; being an increase of £123. The amount received for residuals was £5839, which was an increase of £1624. It was just possible that the extra amount received for residuals was the means of preventing the detection of the late Secretary's defalcations; otherwise the overdraft at the bank would have caused alarm, and possibly the robberies would have been detected earlier. The gross profit on the gas-works was £11,249; and no addition had been made to the capital account. This was no mean achievement. It was by far the largest profit ever made at the Longton Gas-Works; and it should afford some consolation to the ratepayers to know that, while the late Secretary had embezzled sums amounting to £2970, the profits made had enabled the Committee to write off the whole of this amount and to contribute £2000 in relief of the rates, and leave a balance of £158 in aid of the deficiency on the electricity account. The general working results for the year had been exceptionally good; the gas made per ton of coal being 11,400 cubic feet, the gas sold and paid for per ton 10,467 cubic feet, and the coke sold as fuel for the retorts only just over 10 per cent. of the quantity made. In the whole of England there were very few gas concerns that could show such a record of successful working results as those given in the statement of accounts. The Committee felt that the credit for these good results was due to the Manager (Mr. W. Langford), who had worked well in bringing them about. As regarded the future, the market for residuals was so unsettled that it was not possible for them to estimate whether they should be so successful next year as they had been during the twelve months just past. Still, the Committee had decided to hand over by March 31 next £2000 out of the anticipated profits. Over and above the £2900 which had been paid out of last year's profits, there was still left something like £1150 to be paid during the coming year to meet the deficiencies which the late Secretary had caused. Towards this, they had £500 from the Guarantee Society, thus bringing the amount down to £600. So after all, he thought, there was some little encouragement for them; and if the Committee were allowed a free hand, they would do their best to secure as much profit to the town as possible without further increasing the capital.

During his speech, Alderman Brookfield was several times interrupted by a member who asked questions with reference to the recent case of embezzlement; and when he sat down, this gentleman (Mr. Preece) moved the suspension of the Standing Orders for the purpose of discussing how it was that the late Secretary was able to get hold of so large a sum of money without the Committee's knowledge. Alderman Bennion, however, pointed out that a Committee of Inquiry was at

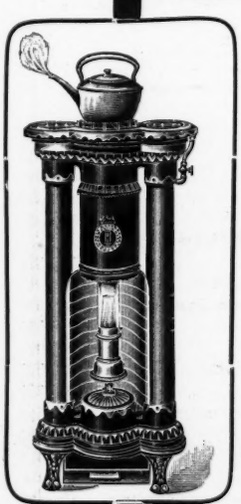
PURE HEAT

WITHOUT SMOKE OR SMELL.

CLARK'S PATENT HYGIENIC

"SYPHON"

GAS STOVES.



The simplest and most economical gas apparatus for producing heat.

It gives invariable satisfaction to consumers, both from efficiency and economy in use.

SEE THE NEW DESIGNS IN—

"SYPHON" GAS RADIATORS,

SOLD AND LET OUT ON HIRE BY ALL THE LEADING GAS COMPANIES.

DROP US A LINE FOR CATALOGUE AND FULL PARTICULARS.

S. CLARK & CO., Patentees and Makers, Compton Works, Canonbury Road, Highbury, London, N. Show-rooms: 58, Holborn Viaduct, E.C. Telegrams: "Syphon Stoves, London." Telephone: 1777 North.

work, and that it would be better to await their report. The Town Clerk (Mr. G. C. Kent) said that probably by the date of the next meeting he might be able to say something on the matter; and it was his intention to draw up a report from his own point of view. Mr. Preece thereupon withdrew his motion. Mr. Brookhouse next moved the suspension of the Orders, on the ground that the remarks of Alderman Brookfield had left the Gas Committee in a false position with the public; but he found no seconder.

Subsequently, some discussion took place on a proposal that a salary of 4s. a week should be given to articled pupils on the works; and this having (on the motion of Mr. Preece) been negatived, the minutes of the Committee were confirmed.

GAS LIGHTING OF KINGSTEIGNTON.

The introduction of gas lighting into the village of Kingsteignton, was made the occasion of a little ceremony on Thursday evening last. For many years the streets have been indifferently lit with oil-lamps; but many of the residents have been anxious to obtain better means of illumination, and when an opportunity recently offered for an arrangement with the Newton Abbot Gas Company for an extension of their mains to the village, the Parish Council readily took it up. The Company have laid a 5-inch main to the centre of Kingsteignton, and are now laying 3-inch mains through the various streets. Incandescent lamps are being put up; and by the end of this month the preparations for efficiently lighting the streets will be completed. The first lamp placed in the centre of the village was lighted on Thursday evening by Mr. Butland, the Chairman of the Lighting Committee, in the presence of members of the Parish Council and a large number of the inhabitants. Speeches were made by the Rev. Prebendary Jackson, the Chairman of the Parish Council, and others; and at the close of the ceremony cheers were given for the Lighting Committee and for Mr. J. G. Clarke, the Engineer and Manager of the Newton Abbot Gas-Works, under whose supervision the work is being done. Subsequently, the members of the Parish Council met and (at the invitation of Mr. Butland) drank to the success of the undertaking, and congratulated Mr. Clarke on the great improvement which the new light had introduced and upon the success of the work. Mr. Clarke, in expressing his appreciation of the kind things said of himself and of the work in which he was engaged, remarked that much had been said of the relative value of gas and electricity for lighting purposes. He was ready to grant that electricity had its uses, and for the lighting of shop windows it was in many cases invaluable. For general illumination, however, it was not to be compared with gas, which when used in an incandescent burner was not only the best means of lighting, but was also by far the cheapest.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This week I am favoured, through the courtesy of Mr. James Fleming, the Treasurer of the Gas Department of the Corporation of Glasgow, with a copy of the accounts of the department for the year. They disclose such a stupendous business, that I feel the time at my disposal is not sufficient to do justice to them. On the face of the accounts, I would like to point out that the year's working brings out unmistakably the benefit to the business of gas supply which is to be derived from a reduction in the price of gas. The sum taken off the price last year—3d. per 1000 cubic feet—was a substantial one. It will be remembered that the Gas Committee at first recommended a reduction of 2d. per 1000 cubic feet; but the Town Council asked them to reconsider the matter, and they then came forward with the proposal of a reduction of 3d, which was accepted. The enormous increase in the output of gas of 210 million cubic feet, has at once followed; and it has to be borne in mind that this great increase has taken place in a year which has been distinguished by a lack of vitality in most branches of trade. There have been larger increases in output; but those were in times when business was on the boom—as, for instance, in 1901-2, when the great exhibition was held. In that year, the increase was nearly 243 million cubic feet. Next year, the increase came down to about 68 million cubic feet, notwithstanding a reduction of 2d. per 1000 cubic feet; the lessened rate of increase being doubtless to be attributed to the circumstances that the exhibition year anticipated some of the prosperity which would have fallen to its successor. That the business is increasing satisfactorily is undoubted; for in the past four years the make of gas has gone up by 420 million cubic feet. In the finance department, it is to be noted that the reduction in the price of gas meant a saving of nearly £50,000 to the ratepayers in the year. Through the operation of the continued reductions in the price of gas (which is now 6d. per 1000 cubic feet less than it was three years ago), the revenue has declined from £881,000 to £819,000—a decrease of £62,000; but, concurrently with this, the expenditure has fallen from £723,000 to £675,000—a decrease of £48,000. A feature of the accounts which cannot be passed over is the exceedingly small amount (£587), which was incurred for miscellaneous charges and accidental damages. That an undertaking so large should pay so small a sum for accidental damages as is here indicated, is little less than marvellous. It bespeakes the most careful management in all the departments. There is another item in the accounts which I feel disposed to mention, although I recognize that it scarcely falls within the province of anyone outside the Corporation. That is the Auditors' fee. It is only £120, which is surely a most inadequate sum for an undertaking which has a capital account of two and a quarter millions, and a yearly revenue of over £800,000. I cannot follow the capital accounts in their intricacies;

R R

RICHMOND'S COOKER.

AT HOME: EVERY DAY.

R R

ADVERTISEMENT OF THE RICHMOND GAS STOVE AND METER CO., LTD., CARPENTERS RD., STRATFORD, AND ACADEMY ST., WARRINGTON.

but it is quite evident that when the capital value of the annuities has been reduced from £415,000 to £270,000 in the course of two years, and that when £1,198,000 has been written off for depreciation, the financial policy of the undertaking is being conducted on lines which are thoroughly sound. I have already commented on the soundness of the business; and can say no more than that it is a pleasure to find that in the Commercial Metropolis of Scotland the gas undertaking is so ably conducted that it can be held up as an example to other undertakings, of whatever sort, of the success which usually comes when it is deserved.

The accounts of the Aberdeen Corporation Gas Department for the year ending July 31 have been issued. They show a total revenue of £118,523, and an expenditure of £94,753, leaving a balance of £23,770. The revenue was greater than in the preceding year by £4329, the whole of which increase, and more, was derived from the additional sale of gas. The revenue from the sale of gas amounted to £93,974—an increase of £4376. Residual products realized £21,089, as compared with £21,404. From house-services, there was derived £2801, as compared with £2028; and from gas-stoves, £496, as compared with £920. The balance of £23,770 is greater than that of a year ago by £4390. On the expenditure side, coal cost £54,082, as compared with £57,275. Purifying materials cost £2089, as compared with £1539. The wages of stokers and labourers amounted to £13,960, and maintenance of plant cost £5233. The distribution of gas cost £3198, of which meter inspection amounted to £1367, and the repair and refixing of meters to £1365. Salaries amounted to £1019, house-services cost £2247, and £496 has been written off for gas-stoves. Rents and taxes amounted to £5465. Discounts and bad debts were £3638, of which, however, bad debts represented only £347. During the year a capital expenditure of £12,234 was incurred, raising the account to £328,797. The quantity of coal carbonized was 66,643 tons—as compared with 67,131 tons. The average price per ton of coal was 16s. 2¾d., against 17s. 0¾d. The gas yielded was 649,049,000 cubic feet, which is the largest production in any one year in the history of the undertaking, and is 7,694,000 feet greater than the output in the preceding year. The quantity accounted for was 615,156,000 cubic feet; the unaccounted-for gas being at the rate of 5·22 per cent.—a reduction of 1·41 per cent. during the year. This is the lowest percentage which has ever been attained. The average yield per ton of coal carbonized was 9739 cubic feet. The price was 3s. per 1000 cubic feet, the same as in the preceding year. There are 16,833 annuitants. During the year 302 annuities were redeemed, at a cost of £2429, making a total of 9167 annuities which have been redeemed by the Corporation, at an outlay of £70,767. There is a mortgage debt of £79,665; there having been repaid £69,819 of £149,484 borrowed.

The Committee met on Wednesday and considered the accounts. It is reported that, after a minute examination, they approved of them, and that, after having considered estimates for the current year, they resolved to recommend that the price of gas be reduced to 2s. 10d. per 1000 cubic feet to ordinary consumers, and that for prepayment meters the quantity of gas allowed for 1d. be increased from 20 to 23 cubic feet, which is equal to a reduction of 6½d. per 1000 cubic feet. The revenue for the current year is estimated at £109,226, to which falls to be added the surplus from last year (£6625), making a total revenue of £115,851. The expenditure is estimated at £113,769, which would leave a surplus of £2082. The Convener (Mr. G. Kemp) submitted a proposal regarding accommodation for the workmen. He had, he said, been dissatisfied for a long time with the conditions under which the men had to take their food in the works; and he asked the approval of the Committee to a suggestion of his to spend about £600 in enlarging and modernizing the building presently used for the purpose. He produced plans showing how that could be done, which included the laying of a new floor and the extension of the premises. A new dining-hall, 36 ft. by 28 ft., is to be provided; and the building is to be equipped with modern sanitary appliances. The Committee warmly approved of the proposal, and agreed to recommend the Council to authorize tenders to be invited for the work. This is an idea which is to be highly commended, and all the more so in that it has come from the Convener unasked for by the men. In consequence of the economical production of electricity in the new works at Dee Village, the Committee resolved to close the old station at the gas-works, and to transfer two serviceable generating sets of machinery to Dee Village; and the Manager was instructed to report as to what extent the buildings to be vacated may be used by the Gas Department.

The accounts of the electricity department of Aberdeen Corporation show that, out of a borrowing power of £250,000, the Corporation have borrowed £230,736 – leaving only £19,264 for the extension of the undertaking. There was a revenue last year of £38,209, as compared with £30,336. The expenditure last year was £17,136, which leaves a balance at the net revenue account of £21,073. The amount derived from public lighting was £2782. There are 187 arc lamps—the same as a year ago. About one-third of the electric current produced is used for tramway traction. The unaccounted-for electricity amounted to 7·09 per cent. The Committee resolved that the charges for electric current should be fixed, for lighting purposes, for the first hour, at 6d. per unit, the same as at present, and for all subsequent consumption 2d. per unit—a reduction of ½d. per unit; for public lighting, 6d. per unit for the first hour, and 1½d. per unit for all subsequent consumption, which is also a reduction of ½d. per unit for the subsequent lighting; and for motor and heating purposes, 3d. and 1d. per unit, the same as at present.

At the Dundee Town Council meeting on Thursday, Mr. Speed referred to the explosion in the electric lighting culvert, which I mentioned last week, and asked an explanation as to "these explosions." Mr. Brownlee said the correct explanation had been given in the newspapers, but Mr. Stevenson objected to the remark. The newspapers stated that the explosion was due to an accumulation of coal gas. The main had, however, been examined, and no coal gas was present. There was no smell even of coal gas; and therefore some other explanation must be forthcoming. It was agreed that the matter should be brought up in committee.

There must be satisfaction that, at all events for the present, the prospect of a strike among the coal miners of the country is averted. The question

The "MAIN"

Gas Cooker

WITH LATEST DEVELOPMENTS.

SPECIAL FEATURES.

OUR NEW PATENT ENAMEL is guaranteed free from Lead or other Poisonous Chemicals.

Inside Fittings, Porcelain Enamelled.

Can be supplied with Moveable Burners, if desired.

R. & A. MAIN, LTD.,

LONDON: 49, Queen Victoria Street. | GLASGOW: 26, West Nile Street. | FALKIRK: Gothic Works.

in dispute is as to the minimum wage. It has arisen in consequence of the Scottish coalowners having given notice that they propose to reduce wages below that figure. Since the notice was given, there have been utterances by representatives of the miners in England and Wales which had the appearance of offers of support to the Scotchmen in the event of their striking. This probably is the reason why the Scotch delegates to the conference of the Miners' Federation of Great Britain, which was held at Southport on Thursday and yesterday, were instructed to vote in favour of a general stoppage all over Great Britain in the event of the reduction in Scotland being enforced. This belligerent attitude is probably to be attributed, not so much to an inherent love of fighting, as to the belief that it would be in accordance with the views of the majority of the delegates. This has been found not to be the case; the delegates at the conference having appointed a deputation to wait upon the Scotch masters and endeavour to come to terms in a pacific way. The Scotch owners are to be asked their intentions with regard to wages. This is not a very reassuring attitude to take up, because it would be difficult for anybody, however honestly they might approach such a subject, to say what their intentions might or might not be. In this view, the attitude of the men has somewhat the appearance of being intended to gain time. They might take this course for two reasons—that the season is not appropriate for a strike, or that the miners south of the Border are not able to offer sufficient support. Whatever be the reasons which have led to the Southport decision, it should not be accepted as anything more than a temporary arrangement. The miners, it may be taken for granted, will not accept less than the minimum wage except under the direst necessity; and the masters seem to have made up their minds that they cannot go on paying so much. The indications, therefore, are that there is likely to be serious trouble very soon in the coal trade. A little time gained may consequently be of great value to users of coal.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 3.

Sulphate of Ammonia.

A fair amount of business has been transacted during the week; but as the requirements of buyers were mainly for prompt and early delivery, and could be freely met by makers, there has been little change in values. Quotations remain £11 13s. 9d. per ton f.o.b. Hull and £11 15s. to £11 17s. 6d. per ton f.o.b. Leith and Liverpool; but with the commencement of the new month, there is a tendency on the part of buyers to halt in their operations. As regards forward delivery, no change has taken place in the position; buyers not having advanced their ideas of price, and makers, on the other hand, firmly maintaining their previous quotations.

Nitrate of Soda.

Nitrate of soda continues firm on spot, at 10s. and 10s. 3d. per cwt. for ordinary and refined qualities respectively; and there is some improvement in the forward position.

LONDON, *Sept* 2.

Tar Products.

Markets generally are quiet, and, as a rule, prices are easier, although there has been perhaps rather more business doing. In pitch there have been several transactions during the past week, but the market certainly closes easier all round. One of the largest London manufacturers is reported to have sold a considerable quantity on the Continent, but at a very low figure; while Yorkshire pitch has been sold at a reduction on prices which have recently been ruling. There is a considerable quantity still offering in the Lancashire district, but buyers do not seem inclined to purchase for shipment from this quarter. Continental prices still rule very low, and it is reported that business has been done over the first six months of 1905 at a further reduction. There are still large inquiries from Belgium for delivery from March to December next year, but makers, as a rule, do not care to quote further forward than for June shipment, as they have not secured their supplies of tar past this period. There have been several inquiries in South Wales for delivery all over next year, but consumers' ideas of prices are very much under those at present ruling. On the Continent the fuel trade is undoubtedly dull, and prices of briquettes are reported to be rather easier all round, especially in Belgium. As regards the Midland district, prices still continue fairly steady, which doubtless arises from the fact that most of the producers are well sold for the next two or three months. In benzol, business is quiet, some small sales have been made at 9d. per gallon f.o.b. London, although it is reported in one instance that rather less than this was accepted by dealers for prompt shipment. There is nothing fresh to advise in anthracene. One or two small parcels of 40-45 per cent. "A" quality have been sold at prices varying from 1¾d. to 2d. per unit for prompt delivery, but as regards forward business London makers are still very firm. In solvent naphtha, the position remains unchanged; but the demand for home consumption is undoubtedly good, and stocks are certainly smaller than was the case some little time ago. In carbolic acid, further business has been done for September-October at 1s. 9d.; but consumers do not seem to care to purchase for forward delivery, and it is reported that several parcels which were offered for October-December at 1s. 9¼d. and 1s. 9½d. were declined by buyers. Most manufacturers appear fairly well sold, but undoubtedly just at present it seems impossible to improve the value. In crystals, there is very little doing, and it is very difficult indeed to fix the actual value, as it is reported that dealers are selling at prices very much under those quoted by makers. For creosote, the demand continues fairly good, especially from London, where several parcels have again been sold for export. London makers still ask 1¾d.; but consumers decline to pay this price at present, although at 1⅞d. no doubt a large business could be done. There is a report that lower prices have been accepted in the Yorkshire district, but particulars have not transpired.

The average values during the week were: Tar, 17s. to 21s. Pitch, London, 27s. to 28s.; east coast, 27s.; west coast, 25s. 6d. to 26s.

THE
MAXIM PATENT
CARBURETTOR

For Enriching Gas in Bulk.
Prevents Naphthalene Deposits.

OVER . . . . .
120
MAXIM PATENT CARBURETTORS
HAVE NOW BEEN FIXED.

Among the Companies and Towns supplied are The Gaslight and Coke Company, The South Metropolitan Gas Company, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Oldham, Dundee, Perth, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past **Ten Years.**

More Gas and Saleable Coke per Ton of Coal Carbonized is produced; saving Capital, Labour, Fuel, Wear and Tear, &c.

THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

DEALERS IN
Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.

For Prices and full Particulars, apply to the

Gas Lighting Improvement Co.
LIMITED,
18, Devonshire Street,
BISHOPSGATE, LONDON, E.C.

Benzol, 90 per cent., 9d.; 50-90 per cent., 7d. Toluol, 6½d. Crude naphtha, 2¾d. to 2¼d.; solvent naphtha, 8d. to 8½d.; heavy naphtha, 10d. to 10½d. Creosote, London, 1⅞d. to 1 11/16d.; North, 1⅝d. Heavy oils, 2d. to 2⅛d. Carbolic acid, 60 per cent., 1s. 9d. to 1s. 9½d. Refined naphthalene, £4 10s. to £8; salts, 21s. to 22s. 6d. Anthracene, "A" quality, 1¾d. to 2d.; "B" quality, 1d., nominal.

Sulphate of Ammonia.

The market closes with a rather firmer tone, especially as regards forward delivery, for which there is considerable enquiry. Beckton do not want to sell any for this year, and are reported to have done business at £12 5s. for January-April next year, at which price they are still sellers. Quotations may be taken nominally at £11 18s. 9d. for prompt, and £12 to £12 1s. 3d. for October-December. The South Metropolitan Company ask £12 1s. 3d. for September shipment, and do not care to quote further forward. In Hull, business is reported at £11 12s. 6d. for prompt; and in one instance £11 13s. 9d. is reported to have been paid, but no transactions appear to have taken place for forward delivery. Business has been done in Leith at £11 15s. for prompt, and at £11 17s. 6d. for October-December, while for January-June next year it is reported that further business has taken place at £12 5s. There is not much business at Liverpool. Prices rule from £11 13s. 9d. to £11 15s.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The Lancashire coal trade is approaching a crisis, the result of which it is impossible to foresee. Circumstances, no doubt, warranted a reduction of 5 per cent. in wages, which has been acceded to by the men of the Federation; but the Scotch miners, fearing a further reduction, should the agreement as to the minimum of colliers' wages by the Conciliation Board be abolished (of which notice has been given), a conference was held at Southport on Thursday and Friday by the representatives of over 100,000 miners, to consider the point at issue. After two days' deliberation, it was resolved to send a deputation to the Scotch owners, in order to ascertain what action they propose to take after the dissolution of the agreement. Upon the answer depends what future action will be taken by the miners generally. Added to this, the coalowners of South and West Yorkshire have received a circular from the Secretaries of the Unions of Labourers, Gas-Workers, Steam-Engine Men, and Firemen, pointing out that surfacemen's wages, by the agreement of 1901, "shall vary at the rate of 3 to 5 as compared with variations of miners' wages," and asking for an interview to arrange some machinery to govern future variations of surfacemen's wages. It is to be hoped that the best remedy for the present state of affairs will be found in revived trade. A partial or general strike would take a long time to mend matters. Meanwhile, the Lancashire coal trade is depressed, and will remain so until there is a general revival in the cotton industry. Despite a better business in house coal, stocks are increasing at the pits, even with the long-continued short time working. Prices remain at last week's quotations.

Northern Coal Trade.

There is a slightly better demand for coal; but the supply is ample, and the prices do not show much movement, though there is perhaps a little more inclination to place the forward orders for fuel. In the gas coal trade, the demand is slowly but steadily increasing; and the deliveries are much above what they were in the middle of the summer, though it is a demand that is well and readily met, except for the very best gas coals, which are taken up promptly. For this class of Durham gas coals, the tendency of the prices is slightly upwards to-day. It varies from about 8s. to 8s. 4½d. per ton f.o.b.; while other qualities are from about 7s. 10d. per ton f.o.b. Coke is firm; and although the output of gas coke is now beginning appreciably to increase, it seems to find so far a ready market, without much trouble. Good gas coke is from 10s. to 13s. 3d. per ton f.o.b. the Tyne.

Scotch Coal Trade.

The shadow of a possible strike among the miners is leading to a good deal of activity in the coal market. Prices have accordingly somewhat improved. These are quoted at: Main 7s. 3d. to 7s. 6d. per ton, f.o.b. Glasgow; ell, 8s. to 9s. 3d.; splint, 8s. 6d, to 9s. The shipments for the week amounted to £262,364 tons—an increase upon the previous week of 3246 tons, and upon the corresponding week of last year of 26,371 tons. For the year to date, the total shipments have been 7,398,201 tons—an increase upon the corresponding period of 212,249 tons.

Sale of Shares.—Last week, 144 ordinary £1 shares in the Barnard Castle Gas Company were sold by auction at prices ranging from £1 9s. to £1 10s. each.

Reduction in Price.—The Directors of the Blyth and Cowpen Gas Company notify that, as from the reading of the meters this month, the price of gas will be reduced from 3s. 2d. to 3s. per 1000 cubic feet, less a discount of 5 per cent. for prompt payment. The extra discount to large consumers will be continued as heretofore. With a view to encouraging their more general use, a reduction of 20 per cent. has also been made in the rentals charged for gas-cookers.

Proposed Reassessment of the Southampton Gas Undertaking.—It has been decided by the Southampton Board of Guardians to have the property of the Southampton Gaslight and Coke Company re-assessed. At a recent meeting of the Board, it was reported by the Rating Committee that they had had the matter under consideration, and had decided to accept the offer of a London surveyor to undertake the valuation for the fee of £1 per cent. upon the rateable value as may be determined by the Assessment Committee after receiving his valuation and hearing any objection. The Board endorsed the action of the Committee.

THE

PARKINSON "CROWN" COOKER

SHOWING HOT-PLATE

HINGED TO FACILITATE

CLEANING OF BURNERS, &c.

PARKINSON AND W. & B. COWAN, LTD.
(*Parkinson Branch*),
COTTAGE LANE, CITY ROAD, LONDON.
BELL BARN ROAD, BIRMINGHAM.

Electric Light Failure at Preston.—Owing to a breakdown at the electricity works, Preston was in darkness on Monday of last week. Tradesmen had to close their shops in consequence of the failure of the light; and the performance at the theatre was stopped. At the post office hundreds of large candles were lighted to prevent business being altogether suspended; but as it was, the public suffered the greatest inconvenience.

Loughborough Gas and Water Undertakings.—The recently published abstract of accounts of the borough of Loughborough for the twelve months ending March 31, shows that on the gas undertaking account there has been a further capital expenditure of £2921, bringing up the aggregate to £117,712. The revenue account discloses a profit balance of £6854; the total receipts amounting to £20,191. Against the profit item, however, there was payable £3994 for interest, and £2304 to the sinking fund. The Water Committee received during the year £4815; the water-rate producing £2153, and water-rents £1843, while £500 was received for the supply of water for public purposes. The total expenditure was £6257; £3210 of which was for interest on loans, and £1237 payment on sinking fund.

Dalkey Public Lighting.—At the meeting of the Dalkey Urban Council last Wednesday, the question of the better lighting of the township came up on a communication from the Dublin Gas Company offering to supply 120 square lanterns, similar in all respects to those in use at Kingstown, for the sum of £360, repayable at the rate of £120 per annum for three years, with a fine of 4 per cent. on unpaid balances. The Company agreed to keep the lamps in proper working order for £138 per annum. If this offer was accepted, a reduction of 10 per cent. for gas used for public lighting would be made. A proposal for the electric lighting of the township was introduced, but rejected by a majority; and it was then decided to appoint a small Committee to confer with the Gas Company and report to the next meeting.

Attempted Destruction of a Reservoir by Dynamite.—The New York correspondent of the *Daily Telegraph* a few days ago gave the following account of a dastardly attempt to destroy a reservoir: "Miscreants at St. Mary's, Ohio, have tried to dynamite the dam confining the water in the reservoir. Fortunately the effort was unsuccessful. If the dam had failed, the town would probably have been ruined by flood, and some loss of life would have been inevitable. The reservoir is among the largest in the world; and St. Mary's is situated immediately below. Bloodhounds are searching for the dynamiters, who will probably be lynched by the infuriated mob when found. Later reports state that the explosion was heard at places fully 20 miles distant. There were three separate shocks, which damaged the stonework of the dam, but failed to release the waters. Many houses were shattered, and some persons were stunned. The reservoir extends to a length of 10 miles, is one mile broad, and contains enough water to submerge the entire town. Lately a bitter discussion has taken place relative to the alleged unsafety of the huge reservoir; and it is believed that the present crime will be traced to someone who has taken part in this wordy warfare."

Coventry and the Earl's Court Gas Exhibition.—When the minutes of the Gas Committee came up for confirmation at the meeting of the Coventry City Council last Tuesday, a discussion arose on a recommendation that a contribution of £10 10s. be made towards the expenses of the International Gas Exhibition at Earl's Court. Mr. Halliwell moved that this be rejected, on the ground that, as far as he could see, Coventry was not likely to derive any benefit from such an exhibition. Alderman Andrews seconded, and remarked that it would be better if the Coventry Gas Committee, instead of minding other people's business, were to mind their own. Alderman Webb Fowler thought that it would be better to move that the recommendation be referred back. Alderman Booth, the Chairman of the Gas Committee, supported the recommendation, and pointed out that other corporations throughout the country were contributing in proportion to the amount of their production. Mr. Gonte said the matter would be different if the exhibition was being held in Coventry; and Mr. Rainbow urged that the Council would be establishing a bad precedent. Alderman West supported the recommendation; remarking that, as the Chairman of the Electricity Department, he might have to ask the Council in the near future to make a similar or even larger grant to an exhibition held for the purpose of demonstrating the uses of electricity, both for heating and cooking. Alderman J. Maycock was surprised at the Council spending so much time on so small a matter. Eventually, after a good deal of discussion, the Committee's recommendation was passed.

Waste of Water at Preston.—When moving the adoption of the minutes of the Water Committee at the last meeting of the Preston Town Council, Alderman Hamilton directed special attention to the recommendation for the purchase of waste-water meters to be fixed in the town, at a cost of £273 14s. He explained that this was an attempt to control the waste of water by a new method. An experimental meter had already been put down, and the results were astounding. The question of waste water had occupied the attention of water authorities for a long time past. Personally, he was formerly an active opponent of any policy for putting restrictions on the consumption of water, believing that that which was freely used could not in a sense be termed waste. He had now, however, come to the conclusion that the term waste water was well applied. It was water which escaped in the small hours of the night, and the cry that it was of some use in flushing the sewers was not correct, as had been proved in many instances. The experimental meter had been put down in a small district comprising 360 persons, two public schools with an attendance of 286 scholars, and 77 dwelling-houses. When the meter was fixed, the total daily supply coming through the meter was 18,835 gallons, and this had now been reduced, broadly speaking, to 6000 gallons. There were two systems whereby waste of water could be checked. One was the appointment of a staff of inspectors, and the other was by putting down meters. The former was a very expensive method; and therefore he had no hesitation whatever in inviting the Council to accept the recommendation that had been made by the Committee. This was agreed to.

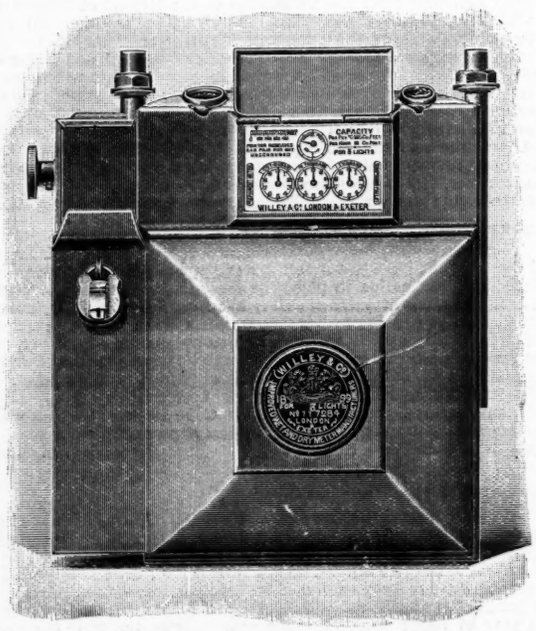
THREE POINTS

of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and Cannot be tampered with through the Slot.

2nd.—The Slot is closed when the maximum number of Coins have been inserted.

3rd.—Our Price-Changing System is the Simplest, Quickest, and most Accurate yet devised.



ALL PARTS INTERCHANGEABLE.

Tens of Thousands in use, and adopted exclusively by many Gas Companies.

WILLEY & CO., LTD., LONDON & EXETER.

Felsted and its Water Supply.—The Dunmow Rural Council yesterday week, by a majority of 13 to 6 votes, declined to proceed further with a scheme for a water supply to the village of Felsted, which was estimated to cost £1200. The scheme was passed by the Council about two years ago by a small majority. The Local Government Board have intimated that if the scheme is not carried out, they have the power to order the work to be done, and charge the cost to the Council. The Council are, however, determined, at all hazards, not to proceed, but to consider an alternative and cheaper scheme, which will be dealt with at the next meeting.

Incandescent Gas in Dublin preferred to the Electric Light.—Mr. Francis T. Cotton, the Secretary and Manager of the Alliance and Dublin Consumers Gas Company, has recently been gratified by the receipt of a letter from the Proprietor of the Leinster Turkish Baths, in which he said that, after six months use of the new gas-lamps fixed by the Company in the baths, he had found them a great success—the light being so well distributed about the room. The gentlemen coming to the baths, he added, are very much pleased with the change; and to his mind "electric light cannot stand beside them." Another important fact mentioned is the large saving of gas.

Rats as the Cause of a Gas Explosion.—On Monday of last week, a somewhat curious explosion occurred under the footway in the neighbourhood of the Southwark Park Road, dislodging some paving stones, and throwing up, among a quantity of *débris*, two dozen large rats which had been killed by the explosion, while a number of others scampered away in all directions. An examination disclosed the fact that the network of gas and water pipes at the spot had formed the nesting place of a colony of rats; and the remains of several matches among the rubbish indicated the probability that they had been carried there by the rodents, and, becoming ignited in some way, had caused the explosion of gas which had escaped from the main and accumulated.

Fatal Accident to a Workman at the Swansea Gas-Works.—On Wednesday last, a workman named Greenwood, in the employ of Drakes Limited, of Halifax, who are carrying out a contract at the Swansea Gas-Works, met with a serious accident while hoisting bricks. He was conveyed to the hospital, where the wound was sewn up, and the man sent home. On Friday night, however, he became delirious, and was again taken to the hospital to undergo an operation. This was performed on Saturday, but the man died on Sunday morning.

The Chemical Engineering Company have received an order from the Stirling Gaslight Company for the supply and erection of all the ironwork in connection with their new sulphate plant—including a Wilton patent ammonia liquor still.

The Rochester Gas Company—through Mr. James Veevers, their Engineer and General Manager—have placed a further order with Messrs. S. Cutler and Sons for adapting two more purifiers to the Jäger system at their works. When completed, the Company will have six purifiers working on the system.

Contracts for the supply of coal for the coming year have just been completed by the Dewsbury Corporation Gas Committee. The cost works out at a saving of 9d. per ton when compared with the previous year—a total saving of nearly £900. To set against this, however, is the fact that the price of some residuals is falling.

Orders have recently been received by Messrs. Joseph Taylor and Co., of Bolton, for a solid plate-lead saturator, acid tank, sulphate of ammonia stores, sulphate drainer, &c., in connection with the plant being erected at the Redcar Gas-Works; also for a circular saturator and evaporating pan for the Sittingbourne District Gas Company, and for evaporating tanks and sulphate drainers for the Guernsey Gas Company and the Malvern Gas Department.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.
GENERAL FOREMAN. Halifax Gas-Works. Applications by September 17.
DRAUGHTSMAN. No. 4260.
DRAUGHTSMAN. C. & W. Walker, Donnington.
MAIN AND SERVICE LAYER. No. 4261.
STOKER. Pavenury Gas-Works.

Situation Wanted.
COMMERCIAL MANAGER. "Routine," c/o Horncastle's, Cheapside, London, E.C.

Coal Gas Tar Wanted.
E. Roney, Bootle.

Plant, &c., for Sale.
PURIFIERS. Devonport Corporation. Offers by September 30.
RETORT IRONWORK. Sunbury-on-Thames Gas-Works.

Plant, &c., Wanted.
AMMONIA STILL. Brotherton and Co., Leeds.

Company Meeting.
OTTOMAN GAS COMPANY. 9, Queen Street Place, Cannon Street, September 13, at One o'clock.

Stocks and Shares.
NEWPORT (I. OF W.) GAS COMPANY. September 12.

TENDERS FOR

Breeze.
COMMERCIAL GAS COMPANY. Tenders by September 14.

Carbon.
COMMERCIAL GAS COMPANY. Tenders by September 14.

Coke.
COMMERCIAL GAS COMPANY. Tenders by September 14.
SHEPPEY GAS COMPANY. Tenders by September 20.
WANDSWORTH AND PUTNEY GAS COMPANY. Tenders by September 22.

Gas Engine and Threethrow Pumps.
RHONDDA URBAN DISTRICT COUNCIL. Tenders by September 15.

Lead and Compo. Pipes.
RHONDDA URBAN DISTRICT COUNCIL. Tenders by September 15.

Lime.
COMMERCIAL GAS COMPANY. Tenders by September 14.

Pumping Station.
RHONDDA URBAN DISTRICT COUNCIL. Tenders by September 15.

Steel Water Tanks.
RHONDDA URBAN DISTRICT COUNCIL. Tenders by September 15.

Stores.
BRADFORD CORPORATION. Tenders by September 15.

Wrought Iron Tubes.
RHONDDA URBAN DISTRICT COUNCIL. Tenders by September 15.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in Advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in Advance.

All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.

JOHN WM. O'NEILL, Managing Director,

PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London E.C. "Volcanism, London."

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are pre- pared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.
Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 25 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd., (Eerste Hollandsche Yzererts Maaty), ROTTERDAM.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

OXIDE OF IRON.
(NATURAL.)
BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.
BALE'S FIRE CEMENT, PAINT, AND GAS COAL.
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

COAL GAS TAR wanted.
ROBINSON BROTHERS, LIMITED. Works: WEST BROMWICH, KNOTTINGLEY, and SPONDON.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers, Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

TO GAS AND WATER OFFICIALS.

MELROSE CYCLES and Slot Copper COLLECTORS. Latest Design and lowest Prices. For Cash or gradual payments. Catalogue free.

MELROSE CYCLE COMPANY, COVENTRY.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.

Telegrams: "ENAMEL." National Telephone 1759.

COAL GAS TAR wanted.
BEST PRICES GIVEN.

SHARPNESS CHEMICAL COMPANY, LIMITED, Sharpness Docks, GLOS.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

ATTERTON'S Patent Charging Machine, especially adapted for Small Works up to 50 Millions. Nearly 40 already supplied, and still supplying. Would soon repay for small outlay. Increased make and reduction in cost.

Apply to E. PADFIELD AND CO., 96 & 98, Leadenhall Street, LONDON, E.C.

SPENT OXIDE.

THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.

Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "METROGAS, LONDON."

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS AND TRADE MARKS

PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA

SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.

For REPAIRS or ALTERATIONS ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."

Largest Practice and most Up-to-Date Works in Britain.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

THE Gas and Water-Works Supplies and Construction Company undertake all Gas and Water Work, Main Laying, &c. Gas and Water Works Financed and Loans Granted. Shares and Stock accepted in part payment for Work and Materials supplied. Gas-Works purchased outright.

Address, 99, CANNON STREET, LONDON, E.C.

ADVERTISER, 31, Married, having held influential positions as Commercial Manager to large works in England, France, and Germany, excellent Linguist, strict Disciplinarian, experienced Accountant, and Organizer, desires permanent position in England, now or later. Highest References. Period of trial accepted. Address "ROUTINE," care of Horncastle's, CHEAPSIDE, E.C.

DRAUGHTSMAN wanted, leading, experienced in Elevating and Conveying Machinery. Good Salary to competent man.

Apply, stating Age, Experience, and Salary required, to No. 4260, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMAN wanted, thoroughly familiar with Gasholders and general Gas-Works Plant, and capable of making Working Drawings and taking out Quantities for estimating or ordering materials.

State Age, Experience, and Salary required, to C. & W. WALKER, LIMITED, Donnington, Newport, SHROPSHIRE.

HALIFAX CORPORATION TAR-WORKS.

WANTED, General Foreman for the above Works. Must have had experience in the distillation of tar and working up of the products. Salary, £130.

Applications, stating Age, Experience, and accompanied by References, to be sent to the Chairman of Committee (Councillor G. H. Wadsworth, Esq.), endorsed "General Foreman," on or before the 17th inst.

STOKER Wanted, used to Shovel Charging. Regular employment to suitable man. For particulars, apply to H. D. SIMPSON, Gas-Works, DAVENTRY.

WANTED, a First-Class Main and SERVICE LAYER for a Provincial Gas-Works. Send Character from last Employer.

Apply, by letter, to No. 4261, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

AMMONIA Still (Second-Hand) wanted. Large Size.

Address BROTHERTON AND CO., LIMITED, Ammonia Distillers, LEEDS.

TAR Contracts Wanted on the Sliding- Scale or at Fixed Prices.

Managers and Secretaries desirous of selling to best advantage, please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

FIVE Million Gallons Coal-Gas Tar wanted per Year. Offerings in large or small quantities—at fixed price—for period of from One to Five Years requested.

Address: EDWARD RONEY, C.E., 9, Queen's Road, Bootle, LIVERPOOL.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE. The whole of the Ironwork complete for three beds of six Retorts, comprising two Street Hydraulic Mains, with Valves. One Cast-Iron Ditto, Arch, Dip, and Ascension Pipes, Foul Main, Six Mouthpieces with Self-Sealing Lids, Twelve Ditto with ordinary Lids, Buckstaves, Sight Boxes, &c., &c. The whole absolutely as good as new.

Apply, S. BARK, Manager, Gas-Works, SUNBURY-ON-THAMES.

GASHOLDER, 40 ft. diameter by 14 ft. deep, in wrought Tank, with six Columns, trellis Girders, and Suspension Gear. In splendid condition. Nearly new.

New GASHOLDER, 40 ft. diameter by 12 ft. deep, with Steel Standards; also new STEEL TANK to contain same.

Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

PURIFIERS FOR SALE.

The Devonport Corporation invite OFFERS for TWO PURIFIERS 16 ft. by 12 ft. by 5 ft. deep, together with lifting apparatus.

The boxes are made with planed joints, and are in good condition. They can be seen and examined on application at the Gas-Works, and must be taken down and removed by the purchaser.

Sealed Tenders, endorsed "Offer for Purifiers," to be sent to R. J. Fittall, junr., Town Clerk, Devonport, on or before the 30th of September, 1904.

SIDNEY E. STEVENSON,
Engineer and Manager.

Gas-Works, Devonport.

COKE.

THE Directors of the Wandsworth and Putney Gas Company invite TENDERS for the removal of about 10,000 Tons of "WANDSWORTH" COKE from these Works between Oct. 1, 1904, and March 31, 1905.

The Coke to be removed by Van or by Barge (free waterway on River Thames).

Sealed Tenders, endorsed "Tender for Coke," to be delivered here not later than Sept. 22.

The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.

Wandsworth Gas-Works,
North St., Wandsworth, S.W.
Sept. 1, 1904.

RHONDDA URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THIS Council are prepared to receive TENDERS for the Building of a PUMPING-STATION, STEEL WATER-TANKS, GAS-ENGINE, and THREE-THROW PUMPS to pump 12,000 Gallons per hour, to be erected at Blaenclydach.

Contractors to deposit, on application for Form of Tender, a fee of One Guinea, to be returned on the receipt of a *bonâ-fide* Tender after acceptance by the Council.

Plans and Specifications may be seen on application to Mr. Octavius Thomas, the Engineer and Manager, Gas and Water Offices, Pentre, Glam.

The Council are also prepared to receive TENDERS for WROUGHT-IRON TUBES and Lead and Compo. PIPES for Six Months ending March 31, 1905.

Further Particulars and Forms of Tender may be obtained on application to the Engineer and Manager. No Form of Tender other than that issued by the Council will be accepted.

The Contractor in all cases will be required to pay the Standard Rate of Wages recognized in the district.

Tenders, endorsed "Contract No. 7, 8, &c.," as the case may be, addressed to the Chairman of the Gas and Water Committee, to be sent to the undersigned on or before Ten a.m. on Thursday, the 15th inst.

The Council do not bind themselves to accept the lowest or any Tender.

WALTER P. NICHOLAS,
Clerk.

Council Offices, Pentre, Glam.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

COKE.

THE Directors of the Sheppy Gas Company invite TENDERS for the purchase of their surplus make of COKE (about 4500 chaldrons) to be produced during the Year ending the 30th of September, 1905, at their Works situated on the Medway near Sheerness.

Particulars may be obtained from the undersigned, to whom all Tenders must be delivered not later than Tuesday, the 20th of September.

The Directors do not bind themselves to accept the highest or any Tender.

H. BARBER,
Manager and Secretary.

Offices: 2, Trinity Road,
Sheerness.

LIME.

THE Directors of the Commercial Gas Company will be prepared to receive TENDERS not later than the 14th inst., for the supply of WHITE FLARE BURNT CHALK LIME to their Stepney, Wapping, and Poplar Works over the Twelve Months ending the 30th of September, 1905.

Particulars may be obtained from the Engineer at the Offices of the Company, Stepney, E.

The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the lowest or any Tender.

Commercial Gas-Works.
Stepney, E., Sept. 2, 1904.

CARBON.

THE Directors of the Commercial Gas Company are prepared to receive TENDERS not later than the 14th inst., for RETORT CARBON over Twelve Months, from the 30th of September, 1904, estimated at the following quantities.

At the Stepney Works on the Regent's Canal 35 Tons.

At the Wapping Works on the River Thames 100 Tons.

At the Poplar Works on Bow Creek (free waterway), 140 Tons.

The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.

Commercial Gas-Works,
Stepney, E., Sept. 2, 1904.

COKE.

THE Directors of the Commercial Gas Company are prepared to receive TENDERS not later than the 14th inst., for 20,000 tons of Coke, loaded into barges alongside their Poplar Works, on the River Lea, during the Twelve Months ending the 30th of September, 1905.

Two-thirds of the above quantity to be taken between the 1st of October, 1904, and the 31st of March, 1905, in equal monthly quantities, and one-third to be taken between the 1st of April, 1905 and the 30th of September, in equal monthly quantities.

The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.

Commercial Gas-Works,
Stepney, E., Sept. 2, 1904.

BREEZE.

THE Directors of the Commercial Gas Company are prepared to receive TENDERS for the surplus BREEZE produced at their several Works, for the Twelve Months ending the 30th of September, 1905.

The quantities are estimated to be as under; but the same cannot be guaranteed, and may be more or less:—

At the Stepney Works on the Regent's Canal—
1000 chaldrons (of 18 Cwt.) of Fine Coke Breeze.
1000 ,, (of 20 Cwt.) of Rough Pan Breeze.

At the Wapping Works on the River Thames—
2200 chaldrons (of 18 Cwt.) of Fine Coke Breeze.
2200 ,, (of 20 Cwt.) of Rough Pan Breeze.

At the Poplar Works in Bow Creek (free waterway)—
5000 chaldrons (of 18 Cwt.) of Fine Coke Breeze.
6000 ,, (of 20 Cwt.) of Rough Pan Breeze.

The Tenders may be for the whole or for One or more Works separately.

The Contractors must give Security to remove the Breeze as it accumulates, to pay for the same monthly, and generally for the due fulfilment of the Contract.

The Form of Agreement to be signed can be seen at the Company's Offices.

Tenders, sealed and endorsed "Tender for Breeze," to be delivered here not later than the 14th inst.

The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.

Commercial Gas-Works.
Stepney, E., Sept. 2, 1904.

OTTOMAN GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at 9, Queen Street Place, Cannon Street, E.C., on Tuesday, Sept. 13, 1904, at One o'clock precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June last, to declare a Dividend, and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from Sept. 6 to 13, both days inclusive.

By order of the Board,
THOMAS GUYATT,
Secretary.

9, Queen Street Place, Cannon Street,
London, E.C., Aug. 30, 1904.

CITY OF BRADFORD.

TENDERS FOR STORES.

THE Gas Committee of the Bradford Corporation are prepared to receive TENDERS for the supply of the following STORES required in their several Departments during a period of One Year ending Sept. 30, 1905 :—

	Probable quantity required.
Wet and Dry Gas Meters	
Pipes and Castings	
Wrought-Iron Steam Tubing	
Best Merchant Iron and Steel	20 tons.
Charging Shovels	50 dozens.
Oxide Wiskets	25 dozens.
Cotton Waste	40 cwt.
Best Engine Oil	1500 gallons.
Common do.	1500 gallons.
Cylinder Oil	500 gallons.
Tarred Gaskin	40 cwt.
Brass Main Gas-Cocks	120 dozens.
Weed Brooms	50 dozens.
Best Lime	100 tons.
Copper Lamps	300
Lamp Irons	300

Samples may be seen at the Mill Street Gas-Works, where Forms of Tender and any further Information required may be obtained.

The Contract will be let subject to the Fair Contracts Clauses of the Corporation, which may be seen at the Town Clerk's Office, and which the accepted Contractor will be required to sign.

Tenders, endorsed "Tender for Stores," to be sent to me not later than Thursday, Sept. 15.

The lowest or any Tender will not necessarily be accepted.

FREDERICK STEVENS,
Town Clerk.

Town Hall, Bradford,
Aug. 27, 1904.

NEWPORT (ISLE OF WIGHT) GAS COMPANY.

INCORPORATED BY THE NEWPORT (ISLE OF WIGHT) GAS ACTS, 1870 AND 1901.

SALE BY TENDER OF £3000 4 PER CENT. PREFERENCE STOCK.

MINIMUM ISSUE PRICE—PAR.

THE Directors invite Tenders, at not less than par value, for £3000 4 per cent. Preference Stock authorized to be issued under the powers and provisions contained in the Newport (Isle of Wight) Gas Act, 1901.

Particulars and Conditions of issue and Forms of Tender may be obtained on application to the Secretary, at the Company's Offices, Newport (Isle of Wight), or of the Company's Bankers, the National Provincial Bank of England, Limited, Newport (Isle of Wight) Branch.

Tenders must be delivered on or before the 12th of September, 1904.

Payment for the Stock to be made as follows:—On application, 20 per cent. on nominal amount applied for, and the balance on or before the 1st of November, 1904.

The Dividends will be payable half-yearly, and will accrue from the date of payment in full.

By order of the Directors,
FRANK KING,
Secretary.

Newport (Isle of Wight),
August, 1904.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

STEAM, OIL, and WATER.

Any Range of Pressure.

Just Published. Crown 8vo, 6s. Cloth.

GAS-WORKS

THEIR

CONSTRUCTION AND ARRANGEMENT

And the Manufacture and Distribution of Coal Gas.

By S. HUGHES, C.E.

Ninth Edition, Revised, with Notices of Recent Improvements.

By HENRY O'CONNOR, A.M.Inst.C.E.,
Author of the "Gas Engineer's Pocket Book."

LONDON: CROSBY LOCKWOOD & SON,
7, STATIONERS' HALL COURT, E.C.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

THOMAS DUXBURY & CO.,

16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to **Mr. EDWARD PRICE,** "Langley," Wyke Avenue, **WORTHING.**

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

THE

"ROTARY"

STATION METER.

Efficiency Demonstrated.

APPLY—

T. G. MARSH,

MAWSON CHAMBERS, DEANSGATE, MANCHESTER.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

Gas Companies are solicited to try Samples of the

MIRFIELD GAS COAL

UNEQUALLED.

Sperm Value 878·85 lbs. per Ton.

Prices and Analysis on application.

The MIRFIELD (GAS-COAL) COLLIERIES CO.,

RAVENSTHORPE, NEAR DEWSBURY.

GAS FIRES

IMPERIAL STOVE COMPANY.

NEW PATTERNS.

WRITE FOR LISTS.

Season 1904-5.

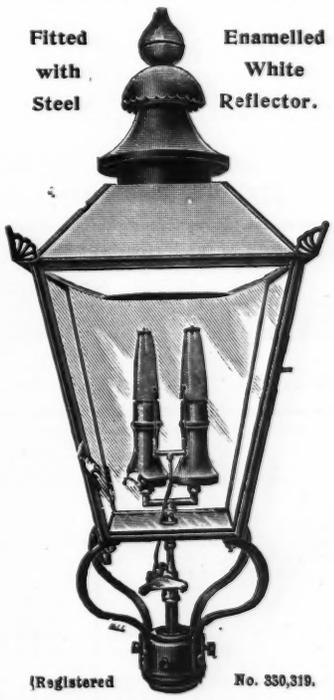
Telephone ONE X, LEAMINGTON.

THE

"KILBURN" LANTERN.

Fitted with Steel

Enamelled White Reflector.



(Registered No. 330,319.

The "Kilburn" Lantern (for double lights) and the "St. Albans" Lantern have been adopted for lighting the Town of St. Helens.

H. GREENE & SONS, Limited,

Surrey Engineering Works,

Blackfriars Road, LONDON.

Telephone 1693 HOP.

Telegrams: "LUMINOSITY LONDON."

TROTTER, HAINES, & CORBETT, LIMITED,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

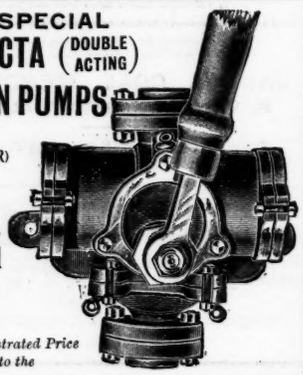
Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

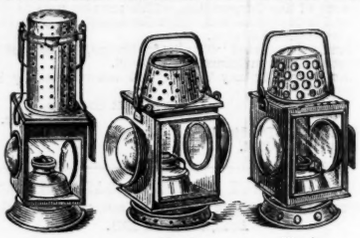
LONDON OFFICE: R. CULL, 34, OLD BROAD STREET, E.C.

HEATHCOTE GAS COAL.
Rich in Illuminating Power and yield of Gas. Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.
THE GRASSMOOR CO., LD.,
CHESTERFIELD.

RAILS.
New and Second-Hand with all Accessories; also Tip Waggons and Turntables.
B. M. RENTON,
MIDLAND WORKS,
SHEFFIELD.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

SPECIAL
PERFECTA (DOUBLE ACTING) PISTON PUMPS
(HAND OR POWER)
FOR
Tar and Ammoniacal Liquor, &c.

Send for Illustrated Price List to the
GEORGE FISCHER STEEL & IRON WORKS,
20, HIGH HOLBORN, LONDON. LTD.,

ARMSTRONG'S PATENT
CANDLE SAFETY LAMPS.

No. 1. No. 2. No. 3.
43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

Now Ready, pp. 584 & XVI. *251 Illustrations.* *F'Cap. Quarto, Price 18s. net (Post Free).*

THE SEVENTH EDITION OF
NEWBIGGING'S HANDBOOK
FOR GAS ENGINEERS & MANAGERS
(DEDICATED TO SIR GEORGE LIVESEY).

The Work has been revised throughout, and contains 40 pages of Letterpress and 12 Illustrations more than the last Edition.
In almost every department additions have been made; and it is believed that the labour bestowed on its production will enhance the value of the book as a Work of Reference.

Orders may be sent through any Bookseller, or direct to the Publisher,
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Wrought-Iron

And Fittings & Accessories.

LAMBERT BROS., WALSALL,
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM.
BRASS GAS-FITTINGS GAS-VALVES STEAM & WATER VALVES TOOLS. &c. AND OF WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., LTD., 91 & 93, SOUTHWARK ST., S.E.

GENERAL HEATING & LIGHTING CO., LTD.,
(MOELLER'S SYSTEM),
26, VICTORIA STREET, LONDON, S.W.

MOELLER'S BURNERS
MAINTENANCE SIMPLIFIED.
Nothing to Corrode. Nothing to Choke.
Nothing to get out of Order.
Made in 4 Sizes consuming, 3, 4, 4½, and 6½ feet. In Brass or Nickelled.
PRICE LIST ON APPLICATION.

G.I.C.

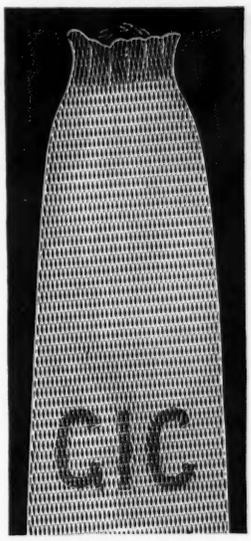
LAMPS, BURNERS, ETC.

G.I.C. Popular High Power Lamp, complete with Improved Silent Burner, price complete, 150 Candles, **16/-**; 250 Candles, **19s.**

G.I.C. High Pressure Burners from **12s.** per doz.

G.I.C. Heavy Steatite Burners, price **5s.** per doz. in gross lots.

For Lowest Prices for everything in connection with Incandescent Lighting see our New Catalogue, just published, which is a complete Buyers' Guide. Post free.



G.I.C.

IMPROVED RAMIE MANTLES.

PRICES. BURNERS.	Per Gross.
G.I.C. Pure Ramie Mantle for "C." .	27s.
G.I.C. „ „ „ No. "2" Kern	27s.
G.I.C. „ „ „ No. "3" „	29s.
G.I.C. „ „ „ No. "4" „	30s.
G.I.C. „ „ Long High Pressure	45s.
G.I.C. „ „ Lucas Lamp **7s.** per doz.	

No Anti-Vibrators are needed where these Mantles are used.

G.I.C. Mantles for Inverted Burners, in finest Double Woven Ramie Thread, best on the market, **45s.** per gross.

SPECIAL QUOTATIONS FOR CONTRACTS, and in 14, 21, and 100 GROSS LOTS.

SOLE MANUFACTURERS:

The GENERAL INCANDESCENT COMPANY, Ltd.,

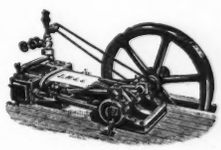
Telegrams: "ASABLAZO, LONDON." 56, CITY ROAD, LONDON, E.C. Telephone: No. 9536 London Wall.

JAMES MILNE & SON, LTD.,

GAS ENGINEERS

MILTON HOUSE WORKS EDINBURGH.

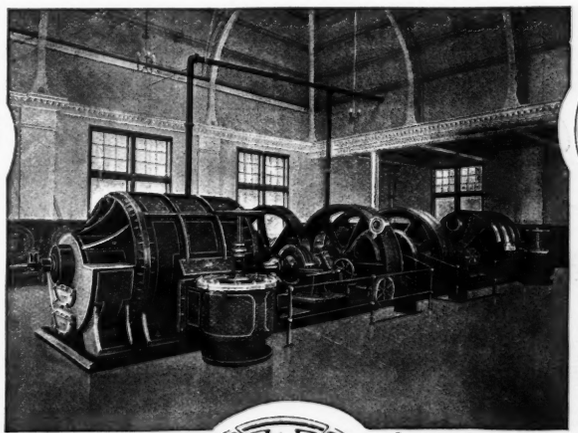
LONDON. —— LEEDS. —— GLASGOW.



R. LAIDLAW & SON,

LIMITED

GAS & WATER ENGINEERS,



SIMON SQUARE WORKS, EDINBURGH.

6 LITTLE BUSH LANE, LONDON, E.C.

TWO EXHAUSTERS EACH TO PASS 750000 CUB. FT. PER HOUR AT 60 REVOLUTIONS PER MINUTE DRIVEN BY TWO GAS ENGINES

AND INTERMEDIATE FRICTIONAL GEARING, ERECTED AT GRANTON GAS WORKS FOR EDINBURGH & LEITH GAS COMMISSIONERS

ALLIANCE FOUNDRY & ENGINEERING WORKS, GLASGOW.

HAVE BEEN AWARDED
HAVE BEEN AWARDED
HAVE BEEN AWARDED
HAVE BEEN AWARDED
HAVE BEEN AWARDED
HAVE BEEN AWARDED

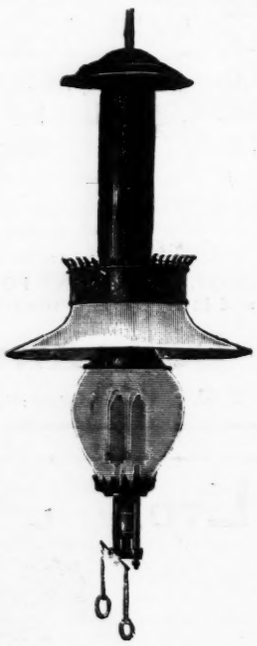
POND & CO.

HAVE BEEN AWARDED
HAVE BEEN AWARDED
HAVE BEEN AWARDED
HAVE BEEN AWARDED
HAVE BEEN AWARDED
HAVE BEEN AWARDED

The "Wis" High Power Lamp.

The "Improved Wis" Lamp.

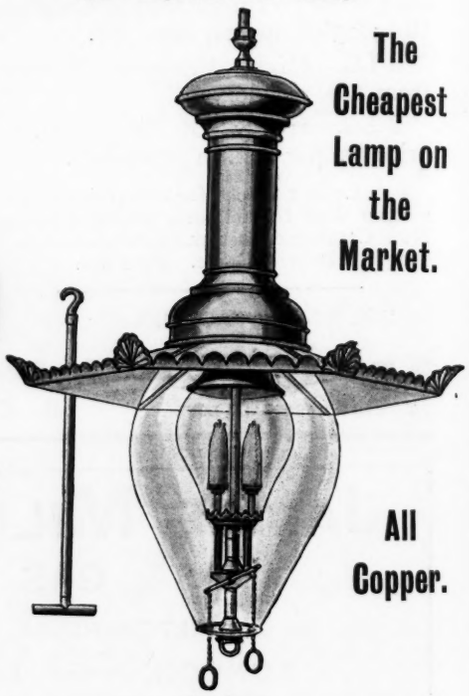
Made in 2 Sizes, 400 and 700 Candle Power.



HAVE BEEN AWARDED

honourable praise and mention from all parts of the world for their many Specialties; and having now greatly improved and cheapened the various Lamps shown, hope in the future to merit

4



The Cheapest Lamp on the Market.

All Copper.

Indoor.

Outdoor.

PATENTED
The "Wis" Indoor Lamp is cheap, perfect and reliable, and has already proved its superiority to other so-called High-Power Lamps. So simple that a child can manage it.
1903.

PATENTED
The "Pond" Lamp is a new and beautiful design finished in Steel Bronze and Gold, and is made for 2 or 4 Burners. By our Patent arrangement 1 or more Burners may be lighted by a single action of the Chains.
1904.

PATENTED
The "Improved Wis" is the most powerful extant, and will give a light of 700 Candles, and stand all wind and weather. Manufactured in its entirety in this country.
1904.

PATENTED
The "Gale Proof" Lantern is the only one made which has proved itself (round the Coast and elsewhere) to be absolutely Windproof, Dust, Gale and Insect Proof. Regenerating and Self-Intensifying. Inexpensive.
1904.

The "Pond" Lamp.

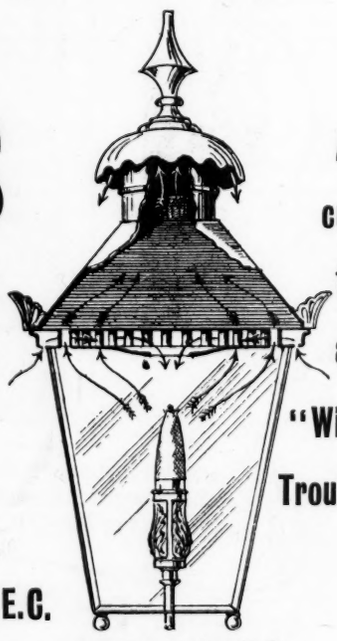
The "Galeproof" Lamp.

Equivalent to other Lamps costing double.

GOLD MEDALS

or even more, and will endeavour to sustain and strengthen the already high reputation they have for up-to-date Methods, Quality, Style, and

FOR EXCELLENCE.



A cure for all "Wind" Troubles.

62, Farringdon St., LONDON, E.C.

All Copper.

Square or Cylindrical.

A right modern Catalogue post free, Smart, Useful, and an "Eye-Opener.'

The Institution of Gas Engineers.

INTERNATIONAL GAS EXHIBITION,

EARL'S COURT, LONDON.

November 19th—December 17th, 1904.

Proposals are invited from Firms having Gas Lighting Systems suitable for Streets, Open Spaces, and Large Halls, for the Lighting of the Approach, Grounds, and Halls of this Exhibition; and also for the Illumination of the Principal Entrance.

It is intended to apportion the available space among the applicants whose proposals are suitable and are received by September 21st. No charge will be made for space, but Exhibitors will be required to provide all material and everything necessary for carrying out the work, and also to have a Stand in the Exhibition at which information respecting their Displays can be obtained.

Full Particulars and further Information can be obtained on application to

THE ORGANIZING MANAGERS, The International Gas Exhibition,
119 to 125, Finsbury Pavement, LONDON, E.C.

"SELAS" LIGHT.

Compressed Air and Gas, Consumption of Gas Reduced to a Minimum.

THE HIGHEST RESULT YET ATTAINED IN GAS LIGHTING.

45 Candles per foot of Gas.

50 PER CENT. SAVING IN GAS CONSUMPTION AS COMPARED WITH THE WELSBACH LIGHT, CANDLE-POWER FOR CANDLE-POWER.

Any Candle Power, from 30-Candles to 2500-Candles, can be obtained with the same amount of economy.

RESULTS GUARANTEED.

TESTIMONIAL. *May 11th, 1904.*

The economy in gas used in the workroom and warehouse, comparing the quarters ending March, 1903, with March, 1904, was as follows:

Gas Account, March, 1903	£12 11 8
,, ,, March, 1904 (Selas)	3 16 3
Saving	£8 15 5

Besides the economy in the gas consumption, the purity and coolness of the atmosphere is even of greater importance. Previously to the installation our people suffered headaches, although the workshops are well ventilated; but under the "Selas" plan, the workpeople have enjoyed better health, and better work is produced. After six months trial of the "Selas" light, we feel sure that its merits will ensure it a permanent success.

We shall be pleased to answer any inquiries, and you are at liberty to publish these results.

(Signed) NICHOLSON & CO., Cloth Proofing Works, ST. ALBANS, HERTS.

ALL INQUIRIES TO BE ADDRESSED—

Messrs. BEVER & WOLF, 46, VICAR LANE, BRADFORD.

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.

SUPPLY FROM STOCK

CAST-IRON RETORTS

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of **LYON'S "PATENT" GAS-MAIN SYPHONS.**

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

THE LARGEST INCANDESCENT MANTLE MANUFACTURERS IN THE WORLD

20,000,000 YEARLY

SEND 30/- FOR ASSORTED SAMPLE GROSS

UNITED CHEMICAL WORKS
JULIUS NORDEN & Co
94 LEADENHALL St LONDON. E.C

20,000,000 YEARLY

LARGEST MANUFACTURERS in the UNITED KINGDOM of GAS-RETORTS,

Horizontal or Inclined; also Makers of Segmental Retorts of all Sections.

PATENTEES OF

Machine-Flanged RETORTS.

DIBDALE WORKS, DUDLEY.

B. GIBBONS, JR., LD.

TELEPHONE DUDLEY NO. 10.

Telegraphic Address: MACHINE, LOWER GORNAL

SPECIAL BRICKS & BLOCKS of every description for GENERATOR and REGENERATOR FURNACES.

Large Stocks of Bricks of all sizes, Burrs, Boiler Seating Blocks and Covers, Plain and Rebated Tiles, &c., &c.

"ABC" Code and UNICODE used for Telegrams and Cablegrams.

Retorts and other Fire-Clay Goods carefully packed for export.

FOREIGN AND HOME COPIES OF ILLUSTRATED CATALOGUES ON APPLICATION.

WILSON CARTER & PEARSON LIMITED,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas and Other Purposes.

ADDRESS CHIEF OFFICES:

Temple Buildings, 50, New Street, Birmingham.

THE LEEDS FIRECLAY CO., LTD.

JOSEPH CLIFF & SONS' BRANCH.

Cliff's Wortley Silica Bricks.

FOR Arches and Crowns where high heats are required. They contain over 90 per cent. of Silica, and are nearly stationary under the influence of heat, swelling a little rather than contracting. They are not like a Gannister or Dinas Brick, but a Fire-Brick of a highly Silicious nature.

Cliff's Wortley Aluminous Bricks.

THESE are for Side Walls where great wear and tear takes place. Are made of a specially prepared mixture, are high in Alumina, and are what is termed a HARD FIRE-BRICK.

BALTIC WHARF, WATERLOO BRIDGE, LONDON, S.E.
Liverpool: Leeds Street. Leeds: Queen Street.

STARTLING INVENTION!

Carborundum Bricks, Carborundum Crucibles, &c.

DR. ENGELS' PATENT CARBORUNDUM COATINGS

For Lining GAS-GENERATORS.

For Lining and Repairing GAS-RETORTS.

For Metallurgical and Chemical purposes, Furnaces, and Firing Plants of all kinds.

The Fire-Proof Products Co., Ld.

Representative: **Richard Cremer,**

CIVIL ENGINEER, WOODHOUSE LANE, LEEDS.

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·20.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

GANDY'S NEW BELT.

Write for Samples and Prices to:

THE GANDY BELT MANUFACTURING Co., Ld.,

Seacombe, Wallasey, CHESHIRE.

TELEGRAMS, "UNBEATEN," BIRMINGHAM. TELEPHONE No. 815.

GAS, WATER & STEAM TUBES AND FITTINGS

THE STAFFORDSHIRE TUBE Co. LTD

HEAD OFFICE Edmund Street, BIRMINGHAM

GAS THE WINSTANLEY SPECIALTY COY. ENGINEERS

GAS ENGINEERS.

CONTRACTORS FOR, AND ERECTORS OF, ALL GAS-WORKS PLANT.

REGENERATORS, GENERATORS, AND DIRECT-FIRED RETORTS.

RESULTS GUARANTEED.

COMPLETE INSTALLATIONS OF HORIZONTAL AND INCLINED RETORTS.

ADDRESS—

NEWTON CHAMBERS, CANNON ST., BIRMINGHAM.

MOBBERLEY & PERRY,

STOURBRIDGE.

INCLINED RETORTS A SPECIALITY.

HORIZONTAL AND SEGMENTAL RETORTS.

BEST QUALITY OF FIRE-CLAY GOODS.

Specials for Water-Gas Plants. Chequer Bricks always in Stock.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND AND WEST OF ENGLAND DISTRICT OFFICE: *6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.*
Telegraphic Address "WIGAN, BIRMINGHAM." Telephone No. 200.

LONDON DISTRICT OFFICE: *6, STRAND, LONDON—C. PARKER & SON, Sole Agents.*
Telegraphic Address: "PARKER LONDON."

GASHOLDERS OF EVERY DESCRIPTION.

SPIRAL GUIDED. — STANDARD GUIDED. — COLUMNLESS.

STEEL TANKS FOR GASHOLDERS OR OIL STORAGE.

WATER-TUBE CONDENSERS — OVER 130 IN USE.

JÄGER FITTINGS WHICH DOUBLE THE CAPACITY OF PURIFIERS.

WATER-GAS PLANT, CARBURETTED OR BLUE.

STEEL BUILDINGS, ROOFS, CHIMNEYS, PIPES.

EVERY REQUIREMENT FOR GAS AND WATER WORKS.

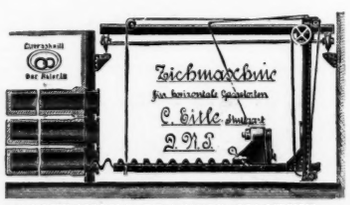
SAML. CUTLER & SONS, MILLWALL, LONDON.

No. 167.

C. EITLE, ENGINEERING WORKS, STUTTGART.

Telegraphic Address: "EITLE, STUTTGART." Telephone: No. 635.

"KOBOLD" CHARGING APPARATUS.



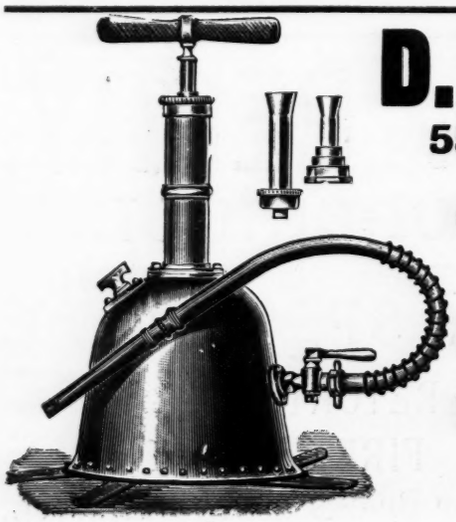
"SCHLANGE" DRAWING MACHINE.

ADVANTAGES OF THE "KOBOLD" CHARGING APPARATUS.

1.—The simplest of all existing Charging Machines, as in charging there is only ONE shaft working.
2.—Almost indestructible in construction, as there are no combustible parts exposed to the heat of the Retorts.
3.—Uniform bed of coal of any desired height in the retort, and consequently any desired weight of charge may be inserted.
4.—Greater yield of gas in comparison with all other types, owing to the coal being deposited in the retort most advantageously.
5.—Least inrush of cold air owing to the close fit of the charging mouthpiece with the retort mouthpiece, with consequently practically no cooling of the retort, the least outrush of flame and smoke, and therefore smallest loss of gas.
6.—Smallest consumption of power.
7.—Most rapid working, as the complete charging of a retort requires only two pulls of a lever.
8.—May be set at any position in regard to height by either manual or motor power.
9.—Lowest cost to purchase; paying interest and redemption in about three years.

ADVANTAGES OF THE "SCHLANGE" DRAWING MACHINE

1.—The simplest and best drawing machine in the world for horizontal retorts.
2.—Least time required to draw a retort (10-15 seconds).
3.—Most careful treatment of the lumps of coke, as well as the retort.
4.—Smallest consumption of power.
5.—Lowest cost to purchase.
6.—Most substantial construction, and consequently very low maintenance charges.
7.—Rapid and cheap working, consequently pays interest and redemption in a few years.



D. HULETT & CO., LTD.

55 & 56, High Holborn, London.

GAS SERVICE CLEANSERS.

LAMP TORCHES.

DRY GAS-METER MAKERS.

WROUGHT-IRON TUBES & FITTINGS.

STREET LAMPS & POSTS.

PRICE LISTS ON APPLICATION.

PATENT "STANDARD" PURIFYING GRIDS.

Orders received for fitting these Grids to 201 Purifiers.

RECENT ORDERS: Gateshead-on-Tyne (1); Ilford (4); Barnet (4); Ticehurst (2); Gerresheim (3); Elbing (3), 2nd order; Kiel (3), 2nd order; Fuerth (4); Dresden (4); Anclam (4); Schmiedeberg (3); Osnabruck (4); and Dirschau (2).

CAPACITY OF PURIFIERS MORE LARGELY INCREASED.

Pressure and Cost of Emptying and Filling more Largely Reduced than by any other System.

Figures from Users verifying this on application to—

KIRKHAM, HULETT, & CHANDLER, LTD. PALACE CHAMBERS, BRIDGE ST., WESTMINSTER, S.W.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, NEAR SHEFFIELD.

Established 1858. The First Manufactory of Silica and Dinas Fire-Bricks erected in England.

MANUFACTURERS OF

SILICA FIRE-BRICKS

TRADE MARK "SILICA."

Our Silica Bricks have gained a high reputation for Unsurpassed Quality in most of the leading Firms in England and on the Continent. Export orders delivered Liverpool, Hull, Grimsby, or the Tyne.

THE HORSELEY CO., LTD., TIPTON, STAFFORDSHIRE.

MAKERS OF

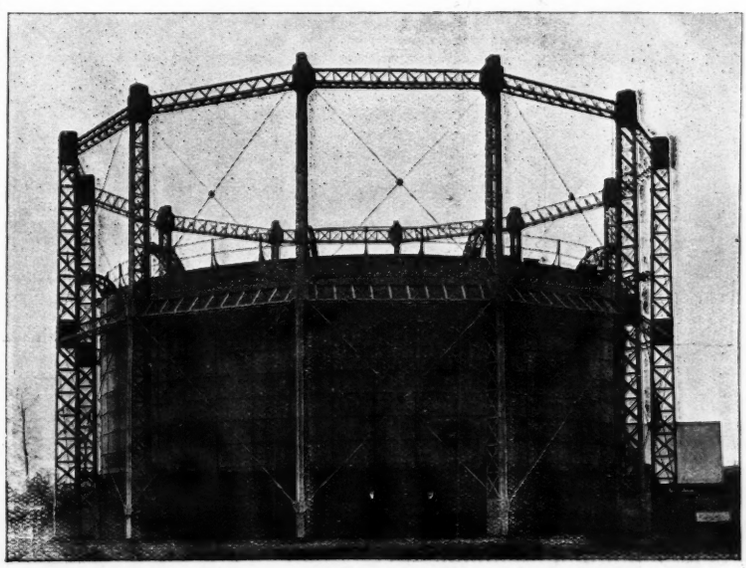
GASHOLDERS & GAS PLANT.

PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES, PIPES, LAMP-PILLARS, RETORT-FITTINGS, ETC.

ALSO ALL KINDS OF

STRUCTURAL IRON AND STEEL WORK

BRIDGES, ROOFS, PIERS, ETC.



WORKS & HEAD OFFICE
TIPTON,
STAFFORDSHIRE.

LONDON OFFICE:
11, VICTORIA STREET,
WESTMINSTER.

TELEGRAPHIC ADDRESSES:
"HORSELEY, TIPTON."
"GALILEO, LONDON."

ARROL-FOULIS

PATENT HYDRAULIC MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS

SIR WILLIAM ARROL & CO., Ltd., Sole Makers,
DALMARNOCK IRON-WORKS, BRIDGETON,
GLASGOW.

LONDON ADDRESS: 32, VICTORIA STREET, WESTMINSTER, S.W.

PLANS AND ESTIMATES FURNISHED ON APPLICATION.

THE **ARROL-FOULIS** MACHINES Are Employed at the following Works—

GLASGOW GAS-WORKS—
Tradeston.
Dawsholm.
Dalmarnock.

GASLIGHT & COKE COMPANY—
Beckton.
Shoreditch.
Bromley.

SOUTH METROPOLITAN GAS COMPANY—
East Greenwich
Vauxhall.
Rotherhithe.

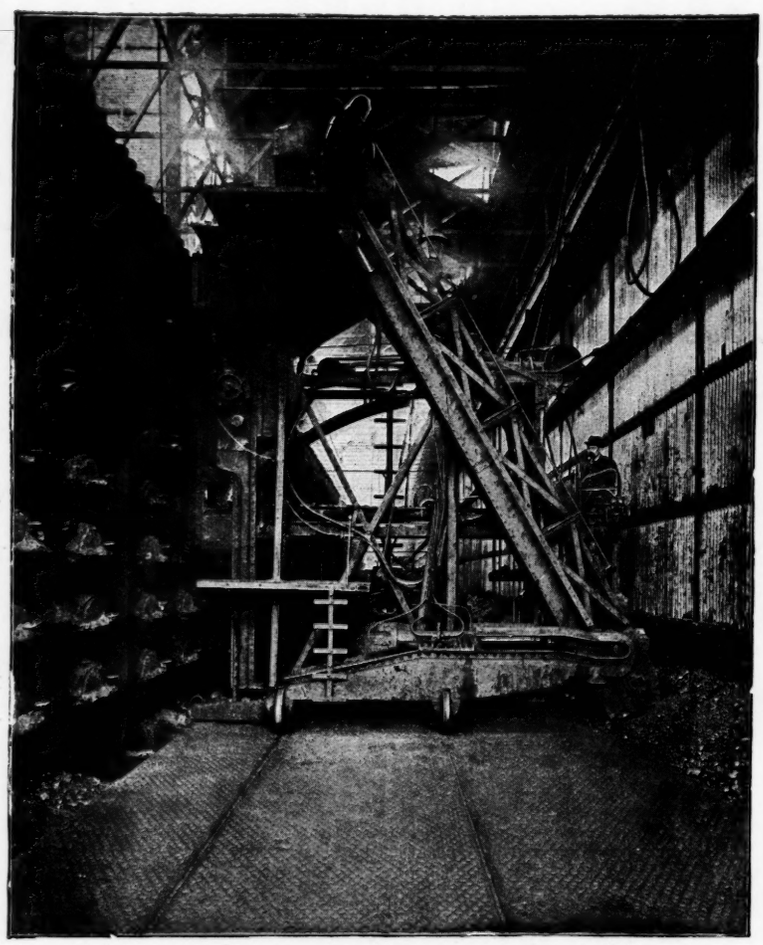
COMMERCIAL GAS-WORKS—
Wapping.
Poplar.

BROMLEY GAS-WORKS (KENT).

EDINBURGH GAS-WORKS.

LIVERPOOL GAS-WORKS.

BRIGHTON GAS-WORKS.



ROTHERHITHE GAS-WORKS.

THE **ARROL-FOULIS** MACHINES Are Employed at the following Works—

LEEDS GAS-WORKS.

BIRMINGHAM GAS-WORKS.

BRITISH GAS CO.—
Hull.

BOLTON GAS-WORKS.

IMPERIAL CONTINENTAL GAS ASSOCIATION—
Amsterdam.
Vienna.
Berlin.

HAGUE CORPORATION GAS-WORKS—
Hague.

METROPOLITAN GAS-WORKS—
Melbourne.

CLEVELAND GAS-WORKS—
Cleveland, Ohio,
&c., &c., &c.

NEARLY **300** MACHINES ARE AT WORK OR IN COURSE OF CONSTRUCTION.

THE TIME TAKEN TO DRAW AND CHARGE EACH RETORT BY THESE MACHINES AVERAGES

UNDER ONE MINUTE.

ALBION IRON WORKS,
MILES PLATTING,

MANCHESTER.
TELEGRAMS—
"STOKER, MANCHESTER."

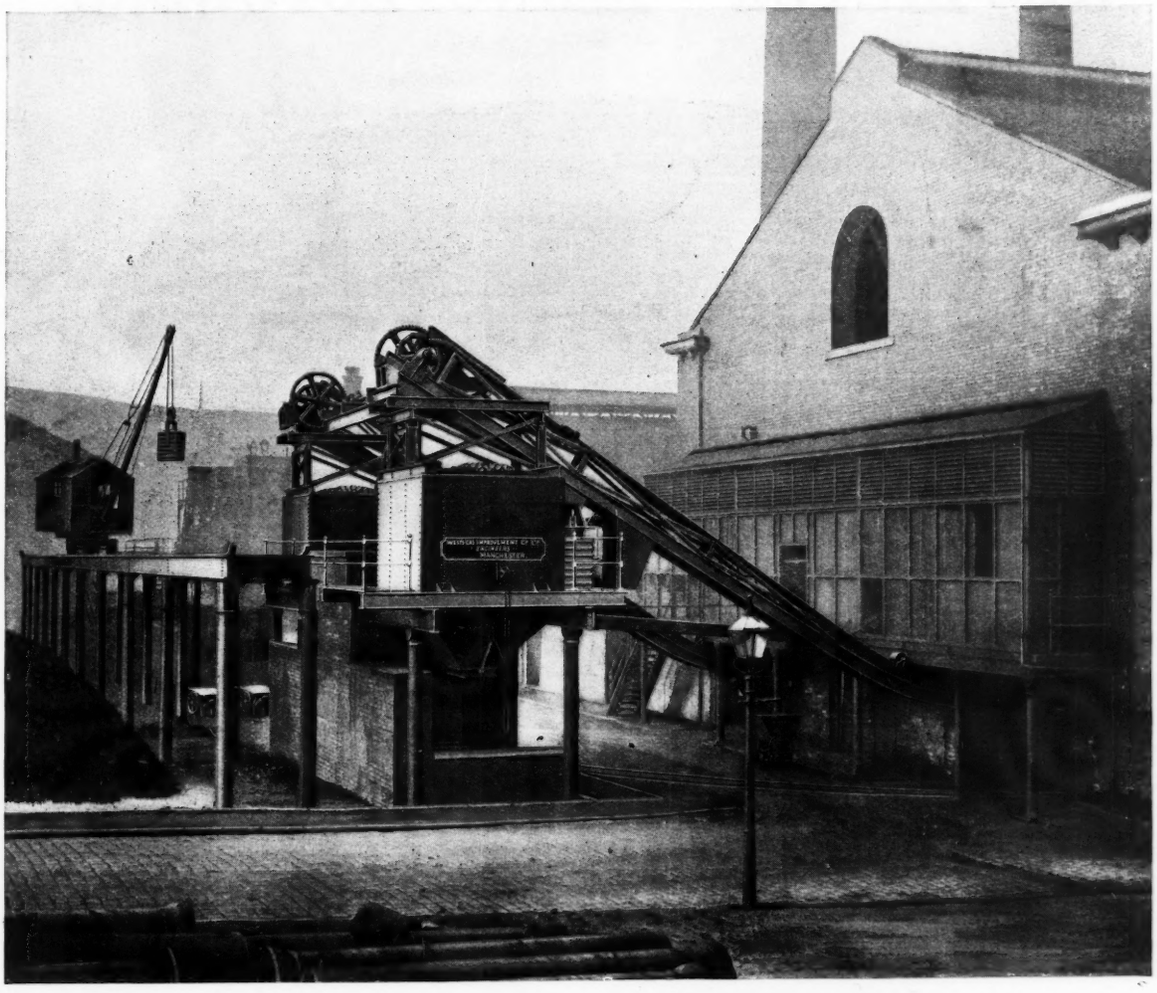
WEST'S GAS IMPROVEMENT CO., LD.,

Gas and General Engineers.

CONTRACTORS FOR
COMPLETE RETORT-HOUSE PLANT

. . EITHER ON . . .

THE HORIZONTAL OR INCLINED SYSTEMS.



Photograph showing West's Coke-Conveyor dealing with the Coke from Nineteen Through Beds of Retorts.

WEST'S IMPROVED PATENT HOT-COKE CONVEYOR,

With Special Chain constructed with a minimum number of parts, and having Large Joint Pins with ample Bearing Surfaces.

WEST'S STOKING MACHINERY—COMPRESSED AIR DRIVEN AND MANUAL SYSTEMS.

COAL BREAKING, ELEVATING, & STORING PLANTS.

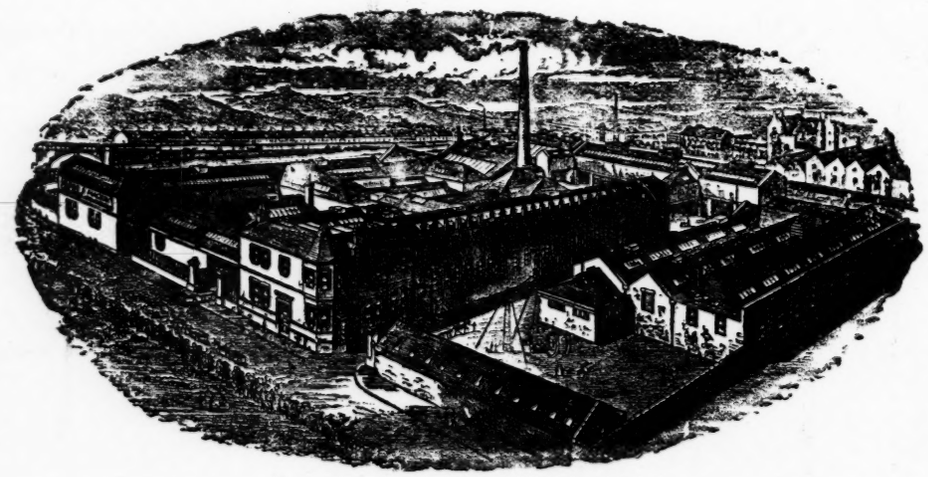
BELTON'S PATENT AUTOMATIC RELIEF APPARATUS FOR HYDRAULIC MAINS.

Manufacturers for America: **Riter-Conley Manufacturing Company, Pittsburg.**

ALDER & MACKAY

ESTABLISHED 1850.

GAS-METER MANUFACTURERS.



SPECIALITIES.

Dry Meters in Cast-Iron Cases.

Wet and Dry Prepayment Meters.

Green's Patent Underground Wet Meters.

NEW GRANGE WORKS, Telephone No. 81 Western. EDINBURGH.

Telegrams: "ALDER" EDINBURGH OR BRADFORD.

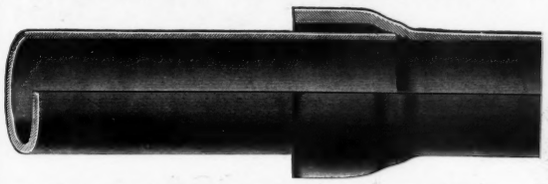
VENTNOR STREET WORKS, Telephone No. 1222. BRADFORD.

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
ESTABLISHED 1860.

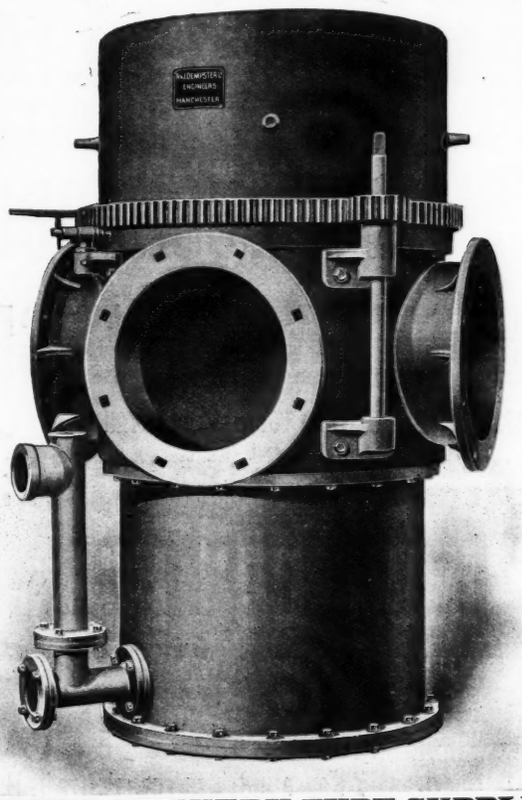
CLAYTON SON & Co LTD LEEDS
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD ALSO
THE ORIGINAL MAKERS OF
SPIRAL GUIDED GASHOLDERS
MAKERS OF ALL KINDS OF STRUCTURAL IRON & STEEL WORK. STEEL FRAMED BUILDINGS ROOFS RETORT FITTINGS PURIFIERS RETORT LIDS ANTIFREEZERS for Gasholders
STEEL TANKS
OF ALL SIZES
MAKERS OF THE LARGEST IN THE WORLD.
GASHOLDERS
OF EVERY DESCRIPTION & SIZE
HIGH CLASS BOILERS FITTED WITH CORRUGATED FLUES.
DEIGHTONS
Telegrams "GAS LEEDS." London Office 60 Queen Victoria St E.C.

MANNESMANN

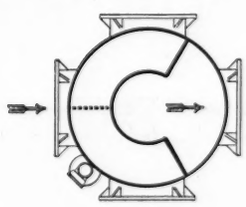


WELDLESS STEEL SPIGOT AND FAUCET PIPES
In any Length up to 40 feet for
GAS & WATER MAINS.
A PERFECT SUBSTITUTE FOR CAST-IRON MAINS.
— THE —
BRITISH MANNESMANN TUBE Co.,
— LIMITED, —
110, CANNON STREET, LONDON, E.C.

R. & J. DEMPSTER, LTD., GAS PLANT WORKS, MANCHESTER.



IMPROVED FOURWAY BYE-PASS VALVES.



Two of these Valves controlling Two Purifiers enable either to be worked first or last and either one or both to be bye-passed.

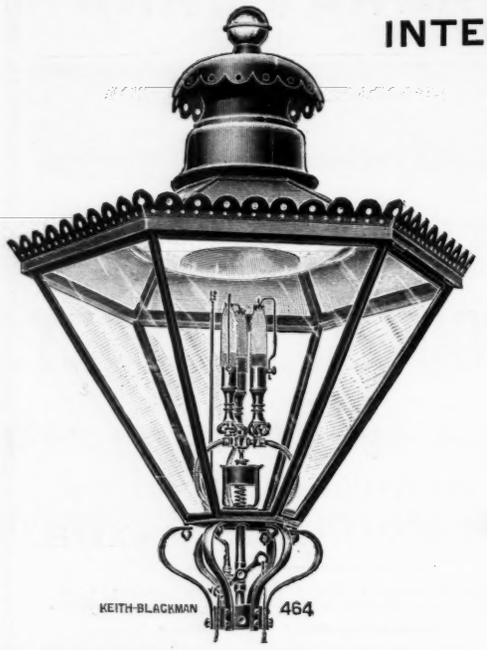
These Valves are specially suitable for reversing the flow of Gas in Condensers.

VALVES OF EVERY TYPE SUPPLIED.

Prices and Particulars on application.

THE KEITH LIGHT.

INTENSIFIED INCANDESCENT GAS.



Hexagonal Reflector Wind-Proof Lantern with Anti-Vibrator and 3-300 c.p. Keith Burners.

1600 INSTALLATIONS NOW IN USE.

KEITH'S LANTERNS are made in numerous designs and sizes.

WIND AND RAIN PROOF.

RIVETED TOPS. MOVEABLE REFLECTORS.

Suitable for both High and Low Pressure Incandescent Gas Burners.

JAMES KEITH AND BLACKMAN CO., LTD.,

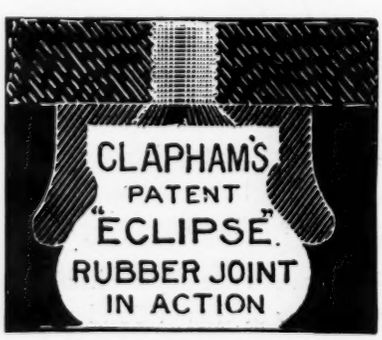
27, Farringdon Avenue, LONDON, E.C.

CLAPHAM BROS. LTD.,

ESTABLISHED OVER 60 YEARS. SOLE MAKERS OF KEIGHLEY.

Laycock & Clapham's Patent **"ECLIPSE" WASHER-SCRUBBER**

Clapham's Patent **"ECLIPSE" WATER-TUBE CONDENSER**



CLAPHAM'S NEW CENTURY COVER WITH PATENT

RAPID AUTOMATIC FASTENERS FOR DRY LUTE PURIFIERS.

Makers of all Ironwork for Carbonizing Plants, for Inclined or Horizontal Systems, Valves, Mains, Lamp-Columns, Tanks, &c.

London Representatives: Messrs. JONES & YOUNGER, Chesterfield House, 98, Gt. Tower Street, E.C.

Printed for WALTER KING by King, Sell, & Olding, Ltd.; and Published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Sept. 6, 1904.